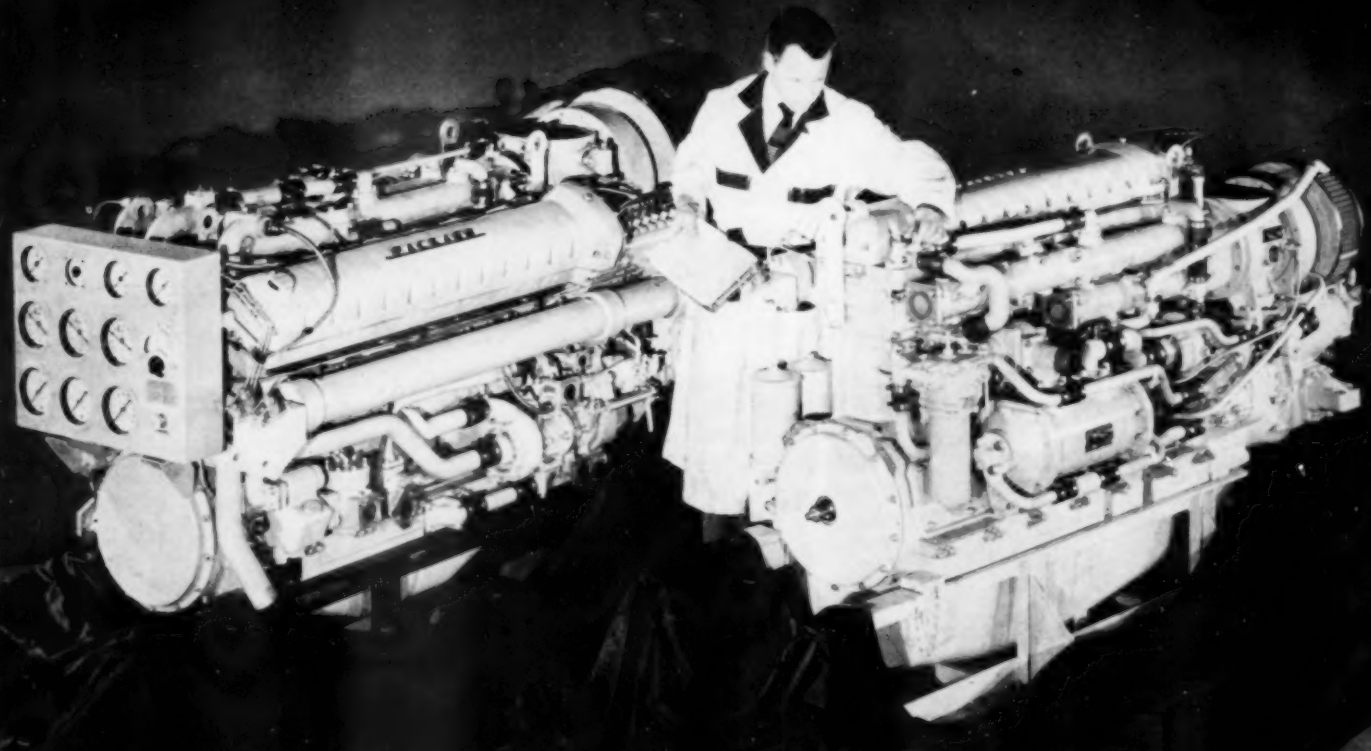
DIESEL PROGRESS



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SEPTEMBER, 1952

FIFTY CENTS PER COPY

GETS FULL POWER-PLUS ECONOMY

...with the help of TEXACO URSA OILS

As in the plant illustrated, operators of Diesel, gas, and dual-fuel engines everywhere are getting full power and low maintenance costs with the help of *Texaco Ursa Oils*. These oils reduce fuel consumption because they keep rings free, ports open, and valves functioning properly—assuring better compression and combustion.

Texaco Ursa Oils are world-famous for their ability to resist oxidation and sludging, to stand up under heat and pressure, and keep engines clean for trouble-free performance. You get longer service life from bearings and all moving parts . . . increased efficiency and reduced maintenance costs.

Texaco Ursa Oils are available in every needed

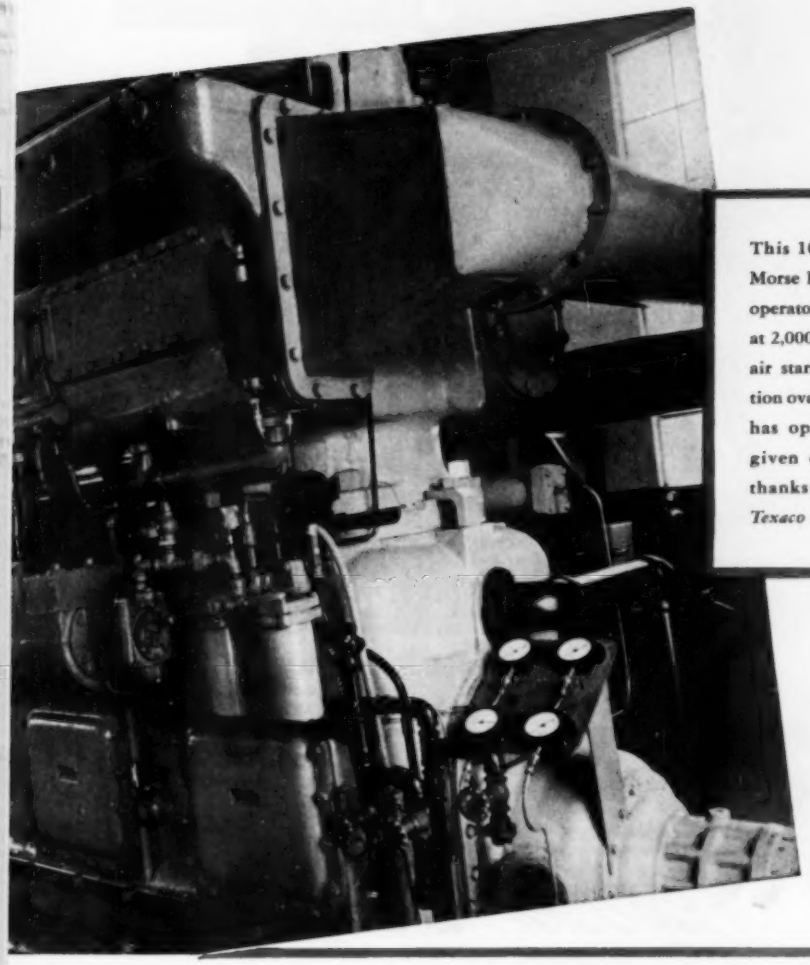
TUNE IN:
On television—
the TEXACO STAR THEATER
starring MILTON BERLE

See newspaper for
time and station.

TEXACO

TEXACO

DIESEL PROGRESS for September, 1952, Volume XVIII, No. 9. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rate: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., authorized.



This 10-cylinder Fairbanks-Morse Diesel engine (name of operator on request) is rated at 2,000 h.p. at 300 rpm, and is air starting. Since its installation over a year ago, this Diesel has operated smoothly and given economical power — thanks to lubricating with *Texaco Ursa Oils exclusively.*

viscosity. Approved by leading engine manufacturers and recommended by users from coast to coast, they are easily America's favorite. In the Diesel field alone:

For over 15 years, more stationary Diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

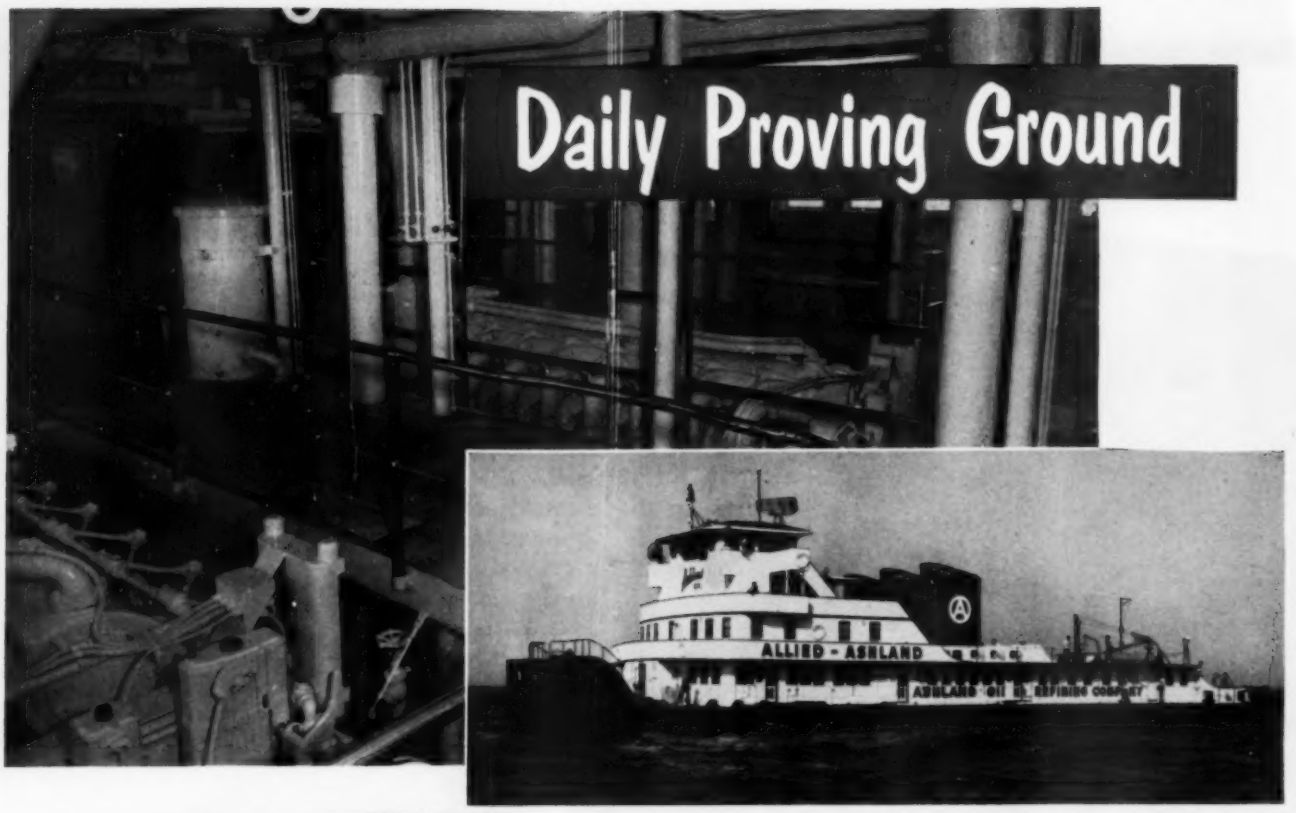
A Texaco Lubrication Engineer will gladly show you how *Texaco Ursa Oils* will reduce costs in your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

Faithfully yours 50 *for Fifty Years*



ALLIED-ASHLAND . . . latest addition to Ashland's river fleet — powered with three 1600 HP diesel engines.

Ashland special DIESEL fuels and lubricants

Day after day, Ashland's fleet of 9 river towboats prove the quality of Ashland Diesel fuels and lubricants. Up and down the Mississippi-Ohio river system our towboats pre-test every improvement in Ashland fuels and lubricants under all types of operating conditions.

This is another reason more and more customers depend on Ashland fuels and lubricants for efficient, economical Diesel operation on railroads, highways and waterways.

Get top performance from your Diesel equipment. Call Ashland Oil today!

ASHLAND OIL & REFINING COMPANY

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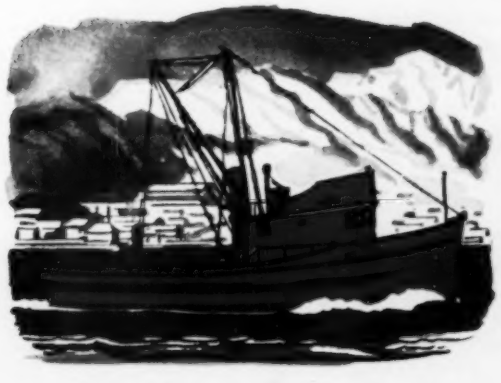
Men who depend on power...know they can depend on CUMMINS®

Every CUMMINS DIESEL *is built not once but twice*



Whatever the power application—whether it's in the marine field or mining, trucking or construction, drilling or handling dozens of other important tasks—you're sure of a consistently reliable performance with a Cummins Diesel on the job.

Every Cummins Diesel is actually built *twice!* After initial assembly and run-in testing, every engine is disassembled, inspected; then reassembled and tested again.

This extra care—together with Cummins' exclusive fuel system and efficient parts and service organization—makes lightweight, high-speed (50-550 h.p.) Cummins Diesels a wise first choice *for men who depend on power.* See your Cummins dealer.

CUMMINS ENGINE COMPANY, INC., Columbus, Ind.
Export: Cummins Diesel Export Corporation
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Leaders in lightweight, high-speed diesel power!

CUMMINS DIESEL

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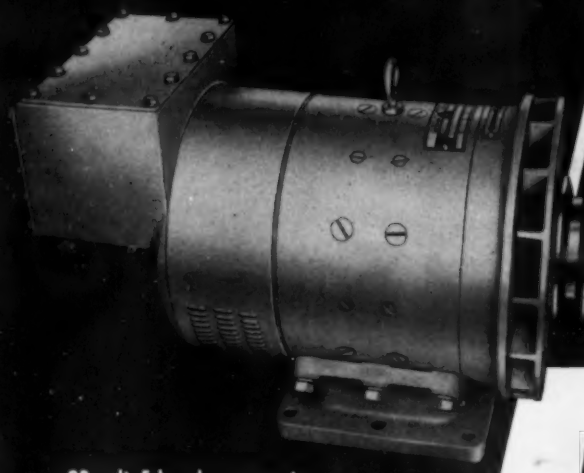


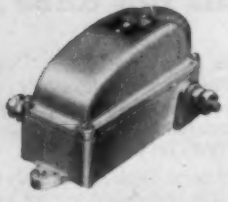
28-volt, 5-kw d.c. generator, of special design for non-magnetic requirements.

Leece-Neville ELECTRIC EQUIPMENT ON PACKARD Navy Diesels

Interchangeable air and electric cranking motors of special light-weight, heavy-duty design.

Heavy-duty control unit to meet exacting requirements for voltage and current regulation.

Powerful, 30 h.p. air cranking motor of special light-weight design.



Magnetic contactor for electric cranking motor.

Leece-Neville is privileged to supply these units for the newly developed Navy Diesel engines being built by Packard. They are typical of the heavy-duty and special equipment which Leece-Neville can build for *you*. The Leece-Neville Company, Cleveland 14, Ohio.

Heavy-Duty Electric Equipment for Over 43 Years

YOU CAN RELY ON Leece-Neville

ALTERNATOR SYSTEMS • GENERATORS • STARTING MOTORS
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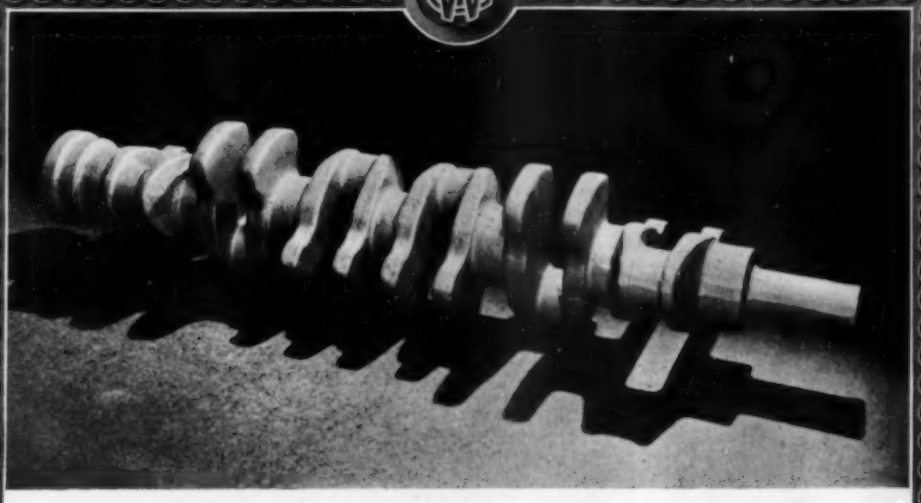

Diesel Power has become a major factor in the truck and tractor field. Here again Wyman-Gordon crankshafts are the standard of the industry.

Crankshaft Specialists since the birth of the internal combustion engine and today the largest producer of crankshaft forgings, Wyman-Gordon furnishes die forged cranks of all types and in weights up to a thousand pounds.

Standard of the Industry for More Than Sixty-five Years

WYMAN-GORDON

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL

WORCESTER, MASSACHUSETTS

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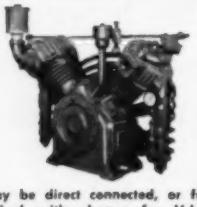
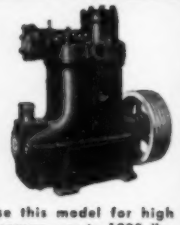
START saving diesel starting costs HERE...

Dependable starting air can cost you less when supplied by one of these efficient, high-grade Gardner-Denver Compressors. There's a size to fit your capacity and pressure requirements exactly.

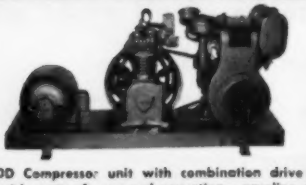
Can be mounted right on the engine. ADA and ADD Two-Stage Air-Cooled units for pressures up to 250 lbs.



May be direct connected, or furnished with sheave for V-belt drive. ADR and ADS V-Type Two-Stage Compressors for pressures up to 250 lbs. per square inch.



Use this model for high pressures—up to 1000 lbs. AB Vertical Two-Stage Water-Cooled Compressor. Tube-type intercooler.



ADD Compressor unit with combination drive—electric motor for normal operation—gasoline engine for emergency starting during power failures.

Our experienced field engineers will help you select the right compressor unit for starting your diesel engines at low cost. Write for full details.

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GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

WATCHING FOR WIGGLES

INSURES SMOOTH PERFORMANCE OF ENTERPRISE STATIONARY DIESELS

Thorough testing by means of the oscillograph and other scientific instruments, means long engine life—free from vibration troubles.

Vibration at critical speeds can lead to broken shafts, damaged gears and costly engine failure. To check these forces and insure smoothest engine operation, ENTERPRISE DIESELS are *performance-tested* by highly sensitive electronic instruments.

For the finest in dependable stationary power, specify quality-built ENTERPRISE DIESELS—the choice of power experts. Models from 68 to 2056 HP, generator sets to 1402 KW. 3, 4, 6 and 8 cylinders, normally aspirated and turbocharged.

Write for free copy of "Taking The Mystery out of Torsional Vibration," Bulletin ES-B7.

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Enterprise DEPENDABLE Diesels

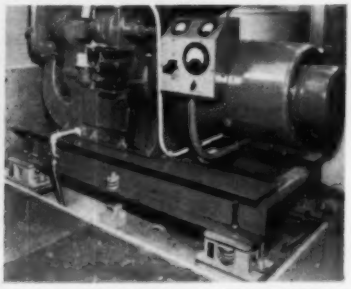
KORFUND FOR VIBRATION-FREE ENGINE INSTALLATIONS

YOU CAN INSTALL ENGINES ANYWHERE WITHOUT VIBRATION TRANSMISSION

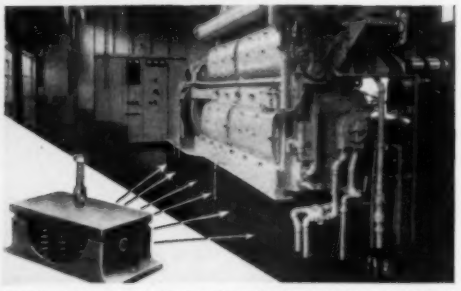
—IF KORFUND ENGINEERS YOUR VIBRATION CONTROL REQUIREMENTS

• Quieter Operation • Lower Maintenance Costs • Lower Installation Costs

Fairbanks-Morse 450-hp. unit at Floyd Bennett Field, Brooklyn, N. Y. Korfund spring-isolated foundation permitted installation on ordinary boiler room floor of existing building. Foundation located above floor because of high water table. Korfund installations of larger, heavy duty diesels include the four 1425 hp. Nordbergs at Bangor Hydro-Electric Co. in Maine.



This Sheppard 2-Cylinder 16 hp. high speed diesel-generator is mounted in a truck trailer beside delicate microwave landing instruments. Isolators protect personnel and precision equipment from engine vibration and protect the generating unit against road shock. Similar arrangements are used for marine and railroad installations.



This Alco 975 hp. six cylinder turbocharged main generating unit installed on a mooring barge operated by U. S. Army is mounted on Korfund Vibro-Isolators for smoother, quieter operation, and to prevent bearing misalignment due to hull distortion.

ENGINE VIBRATION

SELECTOR CHART

How to Use This Chart: Isolation recommendations listed refer to Korfund products described under "Mountings and Materials."

Isolated concrete foundations are required where engine size and characteristics necessitate a stabilizing mass and/or a rigid support for the machine.

Isolation recommended for highest efficiency offers not only maximum vibration isolation, but also, in most cases, easier installation and longer life. Consequently, the over-all cost is often no more than for alternate recommendations.

Selections are based upon normal installation conditions and are subject to variations in event of unusual jeb circumstances. In such cases, consult Korfund, without obligation. Give make, model number, speed and location of equipment in building when ordering isolation.

Engine-driven Generator Units, Compressor Units, Pump, and Power Units	ISOLATION RECOMMENDED FOR HIGHEST EFFICIENCY		ALTERNATE RECOMMENDATION Satisfactory for less critical jobs	
	No Concrete Foundation Required	Concrete Foundation Required	No Concrete Foundation Required	Concrete Foundation Required
Low-speed Diesel and gas:				
1) Single cylinders	—	Type UP	—	Cork
2) Two, three, four and five cyl.	—	Type UP, UN	—	—
3) Six cylinder and above	—	Type UN	—	Cork
High Speed diesel and gasoline	Type LK, SK	—	Rubber	Cork

BULLETIN G-104 gives recommendations for both normal and critical conditions for other equipment such as pumps, compressors, centrifuges, machine tools, presses, hammers and most other processing and mechanical equipment. See Sweet's Catalog Files, or write us for your free copy today.

We'll gladly submit recommendations without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.

MOUNTINGS AND MATERIALS

SPRING TYPE

Korfund steel-spring mountings provide the most efficient method of isolating vibration, approaching 100% in effectiveness. Adaptable to practically any type of installation since their elastic qualities can be predetermined and accurately controlled. Adjustable to meet unforeseen conditions without foundation changes. Load capacities up to 50,000# per mounting. Furnished in several designs to accommodate entire range of disturbing frequencies. Korfund spring isolators usually outlast the engine because all parts, including springs, are designed with a high safety factor.

Type LK

Load Range: 30# to 17,000#. All-directional isolator. Installed directly under engine structural base, or light concrete foundation. Cast semi-steel construction. Fully adjustable with vertical and horizontal thrust control and built-in levelling device. Bulletin LK

For heavy-duty marine, mobile, and stationary installations demanding extreme horizontal thrust capacity. Similar to Type LK (above) except of all-welded steel construction. Bulletin SK

Type SK

Type UN

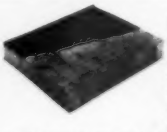
Load Range: 3,000# to 50,000#. Heavy-duty unit used to support heavy engine and concrete inertia mass if required. Built-in levelling device. Separate snubber control when required. Bulletin UN

Type UP

Load Range: 50# to 10,000#. All-steel unit with extra-long springs for isolating very low frequency vibration. Used with structural base or concrete foundation on which engine is mounted. Built-in levelling device. Separate snubber control when required. Bulletin UP

Rubber

Load Range: 1,000# to 8,500# per sq. ft. Effective for absorbing noise, vertical and horizontal vibration. Installed directly under engines, skids, structural bases or concrete foundations. Fine-granule cork plate bonded between two layers of oil-resistant, ribbed-neoprene. Grooved rubber provides increased deflection and forms a non-skid surface. Standard plate 24" X 36" or cut to size, minimum width 1½". 1"thick. Can be cut with knife or circular saw. Bulletin ER



Cork

Load Range: 250# to 3,000# per sq. ft. (Special construction available for loadings to 57,000# per sq. ft.) Economical, easy to install. Excellent in preventing noise transmission and effective as isolator for medium- and high-frequency vibration. Cork is not adversely affected by oil, water, sunlight, heat or cold and, when properly utilized, gives years of effective service. Plates applied directly to bottom and sides of foundation pit and joints sealed, presenting unbroken, watertight form into which concrete is poured. Thicknesses: 1", 1½", 2", 3" and 4". Bulletin C

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

THE KORFUND COMPANY, INC.

48-20BC Thirty-Second Place, Long Island City 1, N.Y.
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PETTER

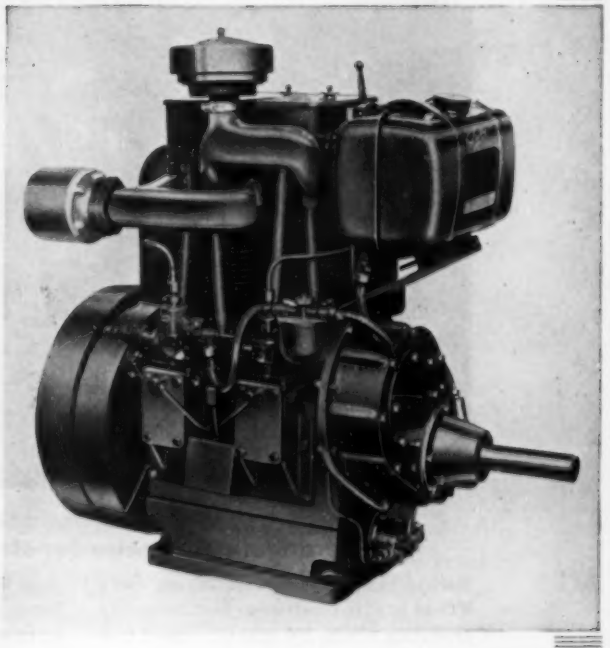
Petter

DIESEL ENGINES

AIR-COOLED · WATER-COOLED

From 3 H.P. TO 40 H.P. LOW COST POWER UNITS FOR

- MARINE AUXILIARIES
- GENERATORS
- PUMPING EQUIPMENT
- COMPRESSORS
- REFRIGERATION
- OIL FIELD EQUIPMENT
- MINING EQUIPMENT
- AGRICULTURE MACHINERY



PETTER RUGGED POWER UNITS
Give you:
Reliability, Low Maintenance Costs
and Low Operating Cost—
only 8/10 Cent/HP/Hour.

Spare Parts & Service Available
World-Wide for more than
300,000 Petter Diesels now in use
—prompt deliveries.

Write for information, still few choice Distributorships Open.

PETTER

Inquire at your local Petter Distributor or Dealer.

ENGINE DIVISION OF **BRUSH ABOE** INC.

EMPIRE STATE BUILDING
350 5TH AVE · NEW YORK 1 · N·Y

Ripping the Cover off the Road Rock

LOW COST STRIPPING IN ACTION. Nathan Lang's TD-24 strips overburden at such a saving that, Lang is planning to get another. Lang formerly had stripping done for him.

Quarry owner finds International TD-24 fastest and most economical crawler for stripping overburden.

Nathan Lang of Charleston, Illinois, uses a TD-24 to strip overburden from his quarry producing 600 to 700 tons of crushed rock per day. He plans to get a second one soon.

Here is the reason in his own words. *"The TD-24 removes overburden faster than any other tractor I ever had in my seventeen years in the quarry business. Moving our own dirt saves us so much we are thinking of getting another TD-24 soon."*

Why the TD-24 performs better than any other tractor is no secret. With 148 maximum horsepower at the drawbar, it moves faster with a bigger bite on the blade. It turns with full loads with power on both tracks. Dozing cycles are speeded up with its fast forward-reverse shift and eight speeds to over 7 m.p.h. both ways.

See your nearby International Industrial Distributor for the key to increased stripping production at lower costs. Look over his shops and well stocked parts department, too. You'll see how well prepared he is to service the equipment he sells. And you'll be a TD-24 man from then on in.

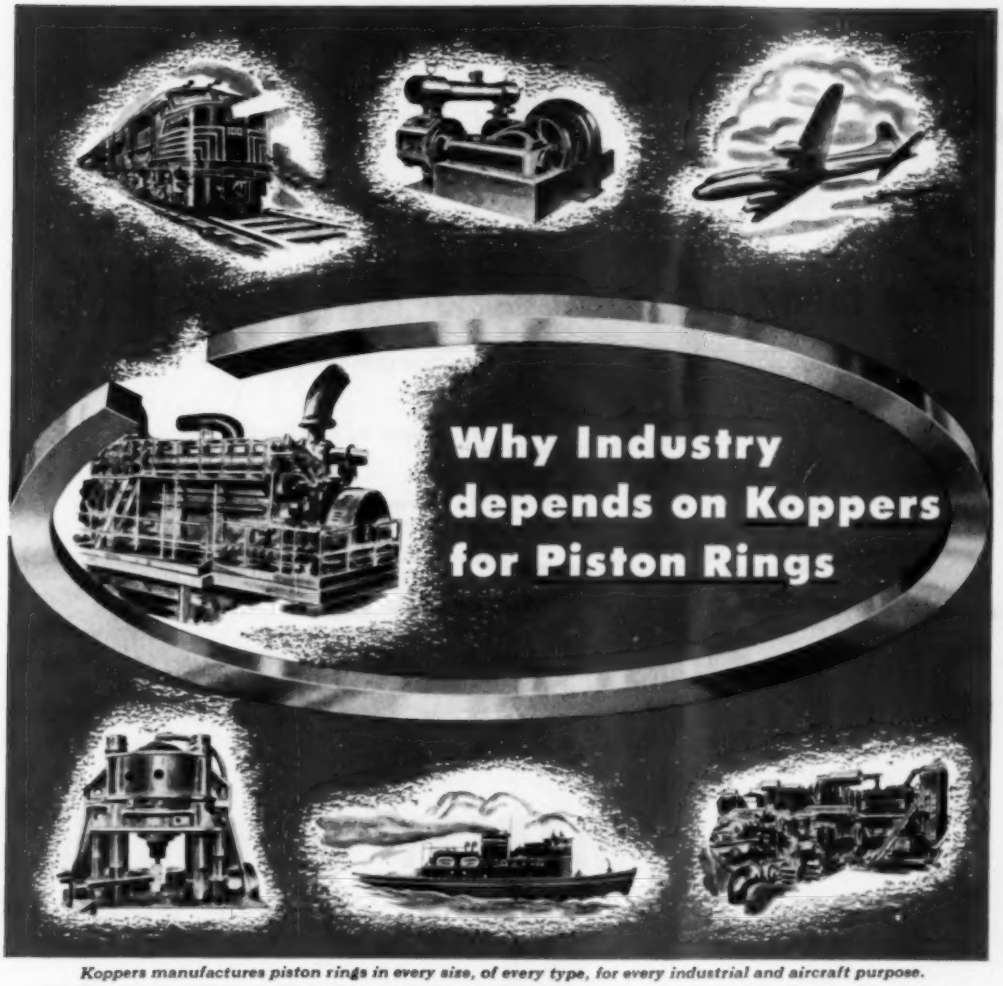
INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

See You at the Polls!

INTERNATIONAL

INTERNATIONAL HARVESTER

POWER THAT PAYS



Koppers manufactures piston rings in every size, of every type, for every industrial and aircraft purpose.

FROM everywhere in industry come reports of savings in time, labor and money through the use of Koppers Rings in diesel and gas engines, hydraulic presses, compressors and other industrial equipment. That's because Koppers research and engineering keep up with modern advances in engine and equipment design by constantly improving piston ring materials and manufacturing methods.

Koppers K-Iron Rings are made of a high-grade, closely-controlled material that imparts improved wear properties and is surface treated chemically as an anti-scuffing aid. They are made in diameters to 120" in a variety of joint types. Koppers Porous Chrome* Rings hold and distribute oil during break-in, quickly wear to best possible seating... *cut cylinder wear up to 50%, last 4 times as long as ordinary rings!*

Our engineers, who work with you in determining the best rings for your applications, have all the facilities of the large, modern Koppers piston ring plant at their disposal . . . to supply you with rings that cut down-time, increase efficiency and lengthen the life of your equipment.

WRITE, wire or phone us today for experienced help with your piston ring problems. KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1589 Hamburg St., Baltimore 3, Md. **Van der Horst Process*

KOPPERS®

Koppers American Hammered Industrial Piston Rings

Only KOPPERS *can furnish K-Spun® and Porous Chrome!*

air cooled
heat exchangers
raise many questions

Feasible for this application ?

Induced Draft or Forced Draft ?

Equipment Location ?

Basis of evaluation ?

How to prevent Freezing ?

Can it cool explosive vapors ?

What type material ?

Method of temperature control ?

MARLEY DRICOOLER*

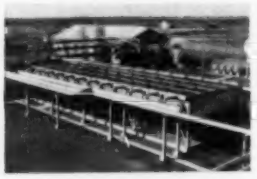
engineering answers them all

Day by day air cooled heat exchange assumes a greater significance to industry. That is why The Marley Company wants you to know more about the technical and economic aspects of this equipment—wants you to have the information that assures its practical, economical application.

To this end Marley makes available, without obligation, the services of its staff of specializing engineers. Through continuing research and practical work with installations the world over, they have acquired a fund of information that will answer your most perplexing heat exchange problems. This information is yours for the asking.

"DriCooler" designates an excellent product and an efficient, informative service. Please use this service freely; just address inquiries to Department DC.

*Registered Trade Name



MARLEY

The Marley Company, Inc.

Engineering Sales Offices in 30 Cities

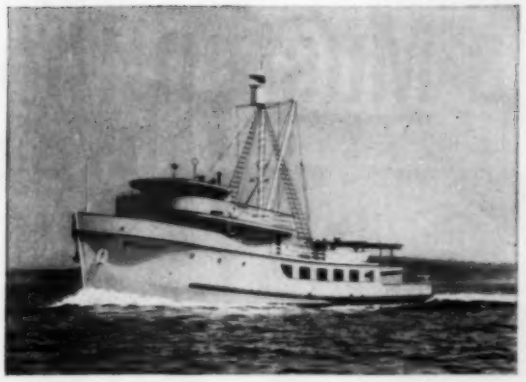
Kansas City 5, Missouri

STAR PERFORMER

in *South Pacific*

and

OLD MAN RIVER



The new clipper Saratoga of the Southern Pacific tuna fleet has as its main propulsion unit an 8 cylinder 800 h.p. supercharged Enterprise diesel with Bendix Fuel Injection Equipment.

Whether the job is catching tuna in the South Pacific or hauling freight on the Mississippi, Bendix Fuel Injection Equipment gives the same outstanding performance that has made it the choice of leading marine diesel engine manufacturers.

Bendix offers to diesel engine manufacturers and diesel operators an unparalleled combination of engineering skill and manufacturing facilities dedicated to the solution of every type of operational problem.

If you are looking for a solution to your fuel injection problems, why not do as so many others have done—look to Bendix for the answer.

Operated by the American Barge Lines Company, between Pittsburgh and New Orleans, the towboat Mount Vernon uses three Cooper-Bessemer diesels with Bendix Fuel Injection Equipment.

BENDIX

FUEL INJECTION EQUIPMENT

SCINTILLA MAGNETO DIVISION of

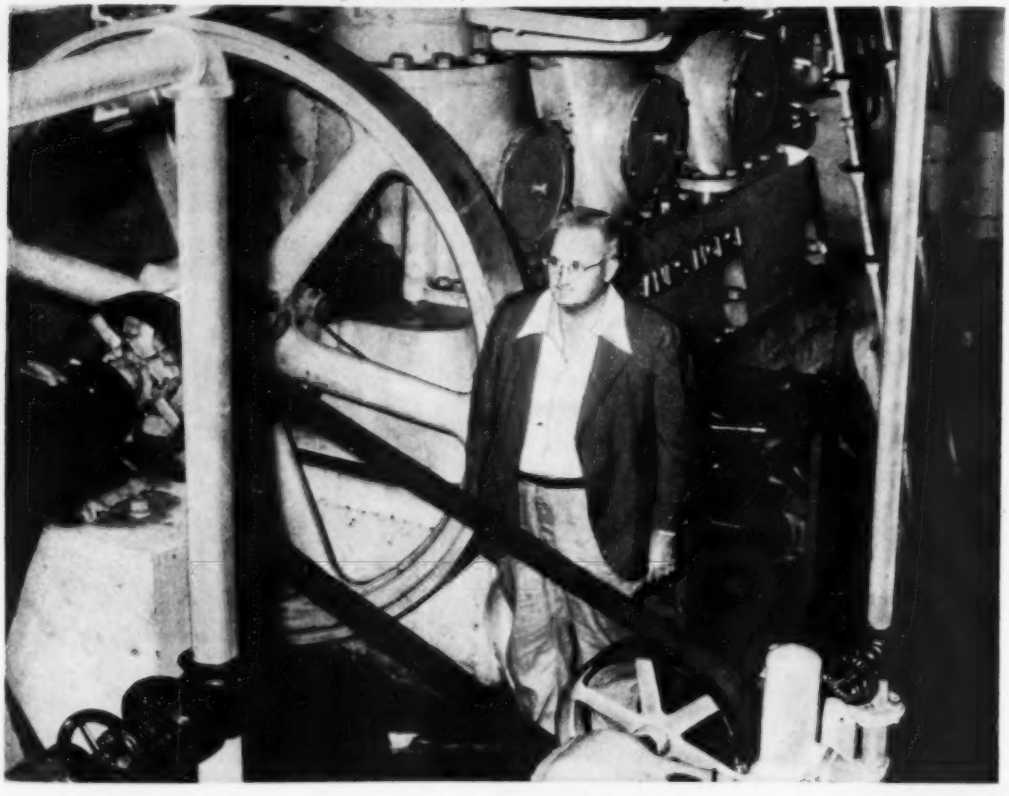
Bendix AVIATION CORPORATION

SIDNEY, NEW YORK

Western Market Office: 582 Market Street, San Francisco, Calif. • Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

Dependable Diesel Power is a Must in The Everglades

...Says Bill Allen, South Florida Conservancy District



"We can't afford stuck rings or carbon here in the Lake Okeechobee area. From May through November, diesel pumps must handle an enormous rainfall — and dependable 24-hour operation is *essential* to the success of our crops."

Mr. Allen adds, "18 years ago, we changed to Sinclair GASCON Oil. It eliminated our problem of sticking rings and carbon deposits in the exhaust ports. We've used this product together with Sinclair Diesel Fuel exclusively for all these years. Our diesels thrive on this combination — we're more than satisfied with Sinclair."

Why don't you, too, change to GASCON® Oil? Give it the chance to help cut maintenance while adding dependability to your diesels. Contact your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Ave., New York 20, N.Y.

SINCLAIR DIESEL LUBRICANTS

THIS YOUNG TUBE-AND-FIN CORE PAYS A BONUS!
● PERMANENT, PERFECT BOND BETWEEN TUBES AND FINS
● GREATER HEAT TRANSFER EFFICIENCY
This die-formed collar provides a tight, permanent bond along entire length of tube as shown in cross section at left.

Here's why Young-designed and built tube and plate fin cores give greater heat transfer efficiency . . . stand up better under peak capacity operation . . . pay bigger dividends in longer trouble-free service. The outstanding design and construction of the Young plate type fin core, shown above, features specially die-formed reinforced collars which make it a continuous, *permanent* bond between fins and tubes . . . providing maximum heat transfer and greatly stronger, longer-lasting cores.

This mechanical structure of greater strength which permits the use of the most desirable metals chosen for the job — copper, aluminum or other alloys—is attributable to Young's precision-manufactured, high-quality cores.

Whatever your need, consult your nearest Young Sales Representative to help you select correct cores—types and sizes—and discuss any phase of your heat transfer problems.

One of our many important installations is the Reynolds Metals Company's new San Patricio, Texas plant which uses more than 80 Young units featuring the new "bonus" core for cooling engine jacket water and lube oil, and 91 additional units of Young variated, specially designed construction.

1927 · 1952
25 YEARS OF PROGRESS

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY

Dept. 402-J ○ RACINE, WISCONSIN
Factories at Racine, Wisconsin and Mattoon, Illinois

If you've never used this—

maybe you should

It's UNIFLEX...

The new Helically-corrugated Seamless Flexible Tube

If you have a process or application involving flexible metal hose, it will pay you to know a few facts about UNIFLEX. For this entirely new, *seamless* flexible tubing is just coming into its own—in applications too critical for ordinary concentric tubing.

Consider . . .

1. We make UNIFLEX from seamless, special bronze alloy tube—tough, corrosion-resistant, leak-proof.

2. Helical corrugations give UNIFLEX greater flexibility and longer life. Our unique method of manufacture eliminates embrittlement resulting from excessive work-hardening.

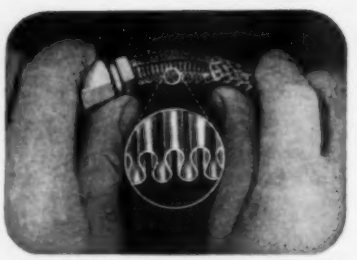
3. For leakless service, UNIFLEX fittings have metal-to-metal seat. Seal is produced through spring washer effect of hose on fitting body.

4. Unlike conventional split-ring collars used on concentric tubing, the *one-piece* UNIFLEX collar hugs 4 or 5 convolutions. This means far less wear —and much greater strength in the connection.

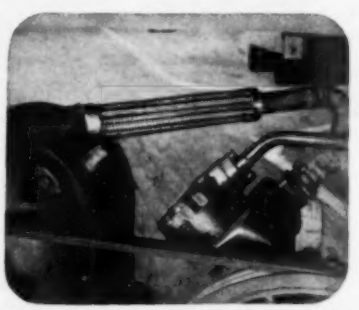
5. UNIFLEX is encased in high-tensile bronze wire braid attached to specially designed couplings. Hose is relieved of damaging strains; sheath prevents elongation, gives extra safety, withstands abrasion.

6. UNIFLEX helical construction distributes flexing between inner and outer surfaces of convolutions —eliminates strain usually limited to one groove. Result: Greater safety and longer life.

7. UNIFLEX fittings are shorter and more compact than most others. This permits the use of more hose length and less fitting length—gives far greater maneuverability, makes it easier to get in and out of tight places.



Note the Helically-corrugated, seamless wall structure of UNIFLEX.



UNIFLEX vibration eliminator used between circulating coils and compressor of a General Electric air conditioning unit. Motor-compressor unit is spring-mounted, requires a flexible connection.

UNIFLEX is supplied in measured lengths, properly fitted and ready for use. You can buy it in sizes from ¼" to 6" ID. It has already proved itself in such applications as hydraulic lines, oil burners, refrigeration machinery, air conditioning equipment, pumps, compressors, diesel engines and machine tools. Our Designers and Engineers have a thorough knowledge of its behavior under exacting conditions. If you'd like to know what UNIFLEX can do for *you* write us about your problem. We'll be glad to help you—without obligation.

Send for your free copy of our new UNIFLEX Catalog. It contains full technical data, sizes, fittings, suggestions for use, and information about new UNIFLEX Quick-soldered Couplings.

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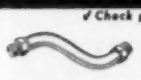

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☐ PRECISION BELLOWS

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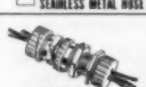

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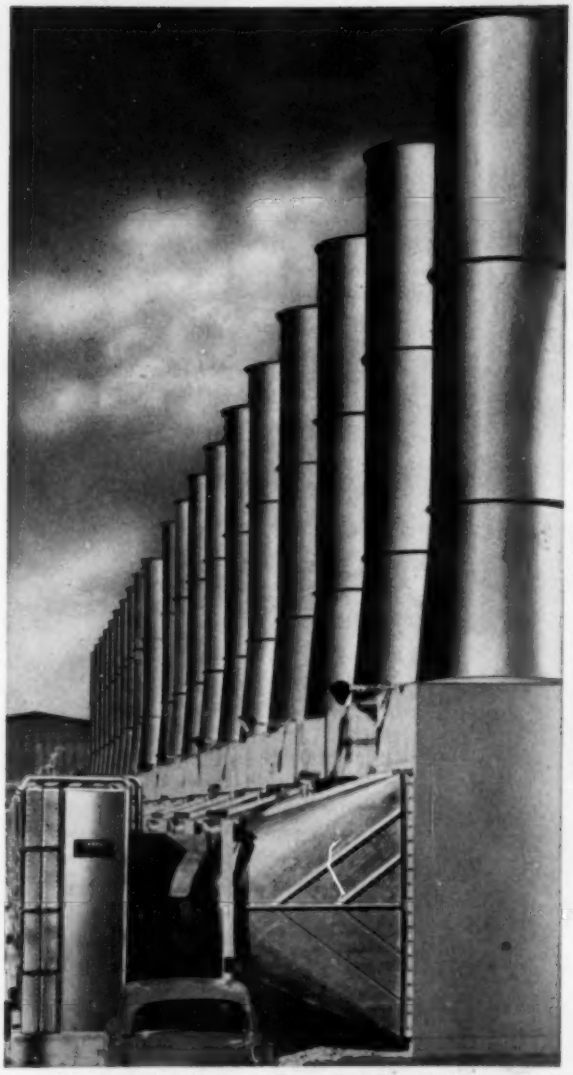
FOR KAISER OR FOR YOU

TRANE builds a diesel cooler that's right!



Here is an installation of TRANE Dry-Type Fluid Coolers at the Kaiser Chalmette plant. If you have a diesel jacket water or lube oil cooling job, contact your nearest TRANE sales office for more information on TRANE Fluid Coolers.

Nearly 240,000,000 BTU Per Hour are removed by TRANE Dry-Type fluid coolers from lube oil and jacket water at the new Kaiser Chalmette, La. aluminum plant. There are eighty 1,820 hp gas engines—and a TRANE Fluid Cooler for each engine.

What are *your* diesel cooling needs? A fraction of the Kaiser requirements? Or greater? You can get the cooling you need from the complete TRANE line of fluid coolers. Consider these advantages:

5 Advantages Of TRANE Closed-System Air Cooling

1. No Water Problems—There's no fouling, so there's no water treating problems, no expensive cooling tower maintenance. Air does the cooling!

2. Many Sizes—Choose from 22 standard sizes of TRANE Dry-Type Fluid Coolers. Special sizes if necessary.

3. Rugged Construction—Strong framework. Famous TRANE fin-and-tube extended surface coils.

4. Low Horsepower Requirements—The combination of plate type fins and carefully engineered fans and plenum chambers means power savings worth hundreds of dollars a year. Adjustable fan pitch and variable speed on many models.

5. Easy Maintenance—Removable header cover plates. Tubes easily cleaned. Motors accessible.

Series EC, horizontal TRANE Dry-Type Fluid Coolers. Fourteen sizes: fan diameter from 18" to 120".

Series GC, giant vertical TRANE Fluid Coolers. Eight sizes: fan diameters from 72" to 144".

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Eastern Mfg. Division: Scranton, Pa.
Trane Company of Canada, Ltd. . . . Toronto
Offices in 80 U. S. and 14 Canadian Cities

AEROQUIP SELF-SEALING COUPLINGS

AND FLEXIBLE HOSE LINES

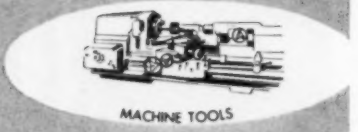
Speed Maintenance

WHEREVER FLUID-CARRYING LINES
MUST BE DISCONNECTED AND RECONNECTED

BUSES AND TRUCKS

RAILROADS

OIL FIELD DRILLING RIGS


MACHINE TOOLS

MATERIALS HANDLING TRUCKS

Speed maintenance, *speed* repair operations and *speed* interchanging of accessories joined by fluid-carrying lines with Aeroquip Self-Sealing Couplings. Lines may be separated in a few seconds without loss of fluid. No air enters the system upon reconnection. There is no need to drain or prime the fluid system. One Self-Sealing Coupling takes the place of two shut-off valves.

Aeroquip

AEROQUIP CORPORATION, JACKSON, MICHIGAN

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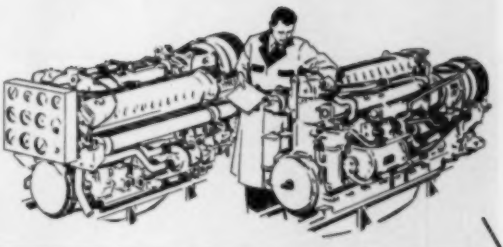
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

World's finest bearings



in the new Packard Marine Diesels

For their exacting assignments, the new Packard Diesels require peak precision in every part.

That's why Packard turned to Allison for both main and connecting rod bearings in its two new marine engines.

Allison steel-backed, electro-deposited silver lined bearings are super-accurate—surfaced to 20 micro-finish or finer.

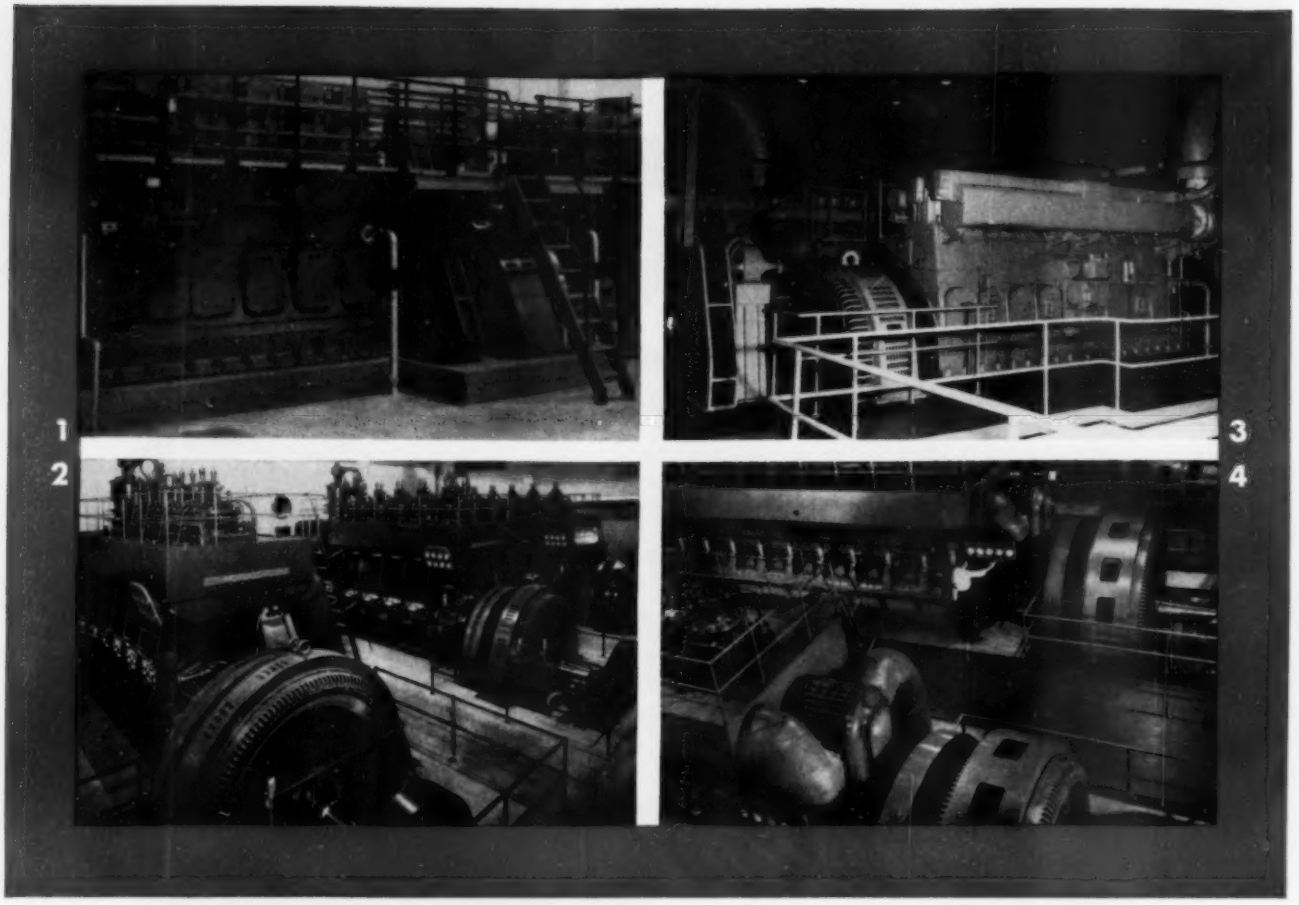
They are manufactured to extremely close tolerances and are tested for accuracy under actual operating pressures—can be assembled in the engines without further work.

These steel-backed bearings have a perfect bond of steel and bearing metal—to take shock and run cool. Allison pioneered this science—has been making precision bearings for more than a quarter century.

Your engine, too, is worthy of the world's finest bearings. *Why not let Allison engineer them for you?*

GM GENERAL MOTORS *Allison*

ALLISON DIVISION OF GENERAL MOTORS
INDIANAPOLIS, INDIANA



Four more tough power problems solved with Westinghouse A-C Generators

1 When Westinghouse was asked to sandwich an a-c generator in between two big twin diesels, an unusual application problem developed. One question was—how to insulate against the flow of shaft currents. Westinghouse engineers came up with a special coupling insulation that paved the way for future installations of this type.

2 Starting 1,000-hp motors at a large western cement plant puts a heavy load on ordinary generators . . . causes considerable voltage drop. Power plant specifications called for a minimum voltage drop. Westinghouse engineers solved the problem with the special generators pictured above—typical of the problem-solving ability offered by Westinghouse.

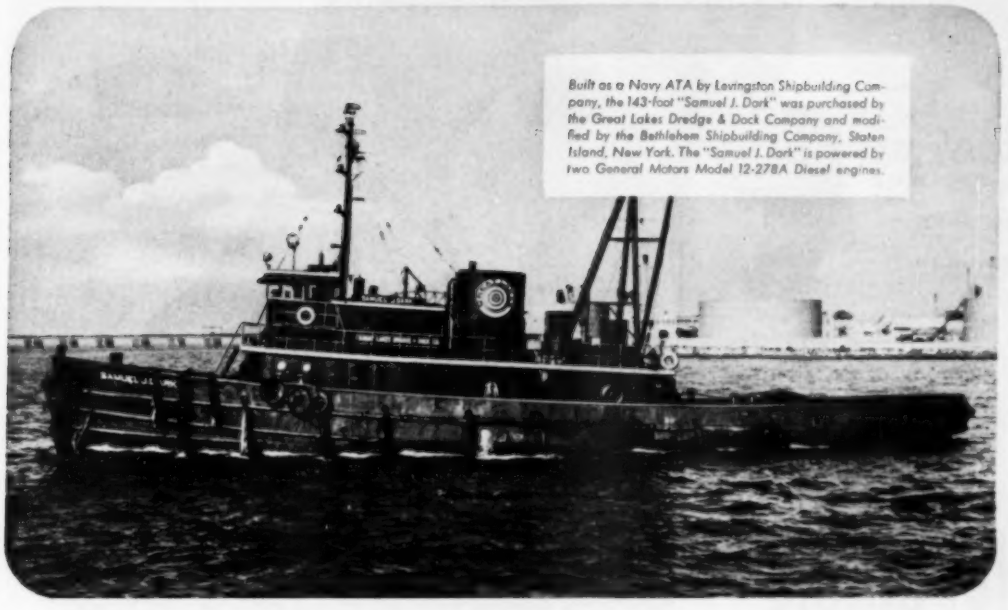
3 Cooper-Bessemer, called on to install a gas-diesel, engine-driven generator at the Yuma, Arizona plant of the Arizona Edison Company, selected the generator that could match the full-load, around-the-clock performance of the 16-cylinder, gas-diesel engine. They chose Westinghouse.

4 At the Langley Aeronautical Laboratory of the National Advisory Committee for Aeronautics, the problem was to supply supplementary power at peak loads to operate the large wind tunnels, and stand-by power to serve the general research needs. Four Westinghouse 6,600-volt, 2,500-kw, a-c generators have been successfully meeting these demands for the past ten years.

What about your tough power problems? Call your Westinghouse representative and let him help you arrive at the best solution. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-10381

Westinghouse

A-C GENERATORS



Built as a Navy ATA by Levingston Shipbuilding Company, the 143-foot "Samuel J. Dark" was purchased by the Great Lakes Dredge & Dock Company and modified by the Bethlehem Shipbuilding Company, Staten Island, New York. The "Samuel J. Dark" is powered by two General Motors Model 12-278A Diesel engines.

GM Diesel Electric Dependability

The "Samuel J. Dark" has been in service in the New York area since November 1946. Working 24 hours a day and turning in between 5,000 and 6,000 hours a year, she has proved to be a dependable vessel.

No Substitute for Diesel-Electric Drive

Cleveland Diesel Engine Division

GENERAL MOTORS · CLEVELAND 11, OHIO

GM DIESEL POWER

ENGINES FROM 150 TO 2000 H.P.

SALES AND SERVICE OFFICES

Cambridge, Mass. • Jacksonville, Fla. • Miami, Fla. • Montreal, P. Q. • New Orleans, La. • New York, N. Y. • Norfolk, Va. • Orange, Texas San Francisco, Calif. • Seattle, Wash. • St. Louis, Mo. • Tampa, Fla. • Toronto, Ont. • Vancouver, B. C. • Washington, D. C. • Wilmington, Calif.

let an old sea dog teach you new tricks

Take a tip from the hard-bitten experience of seasoned old seadogs who skipper diesel-powered fishing craft and other work boats. Pioneers in diesel use, they'll tell you that with modern diesel power there are new tricks you can learn in greater efficiency and unfailing performance . . . lower operating and maintenance costs . . . trouble-free, uninterrupted service.

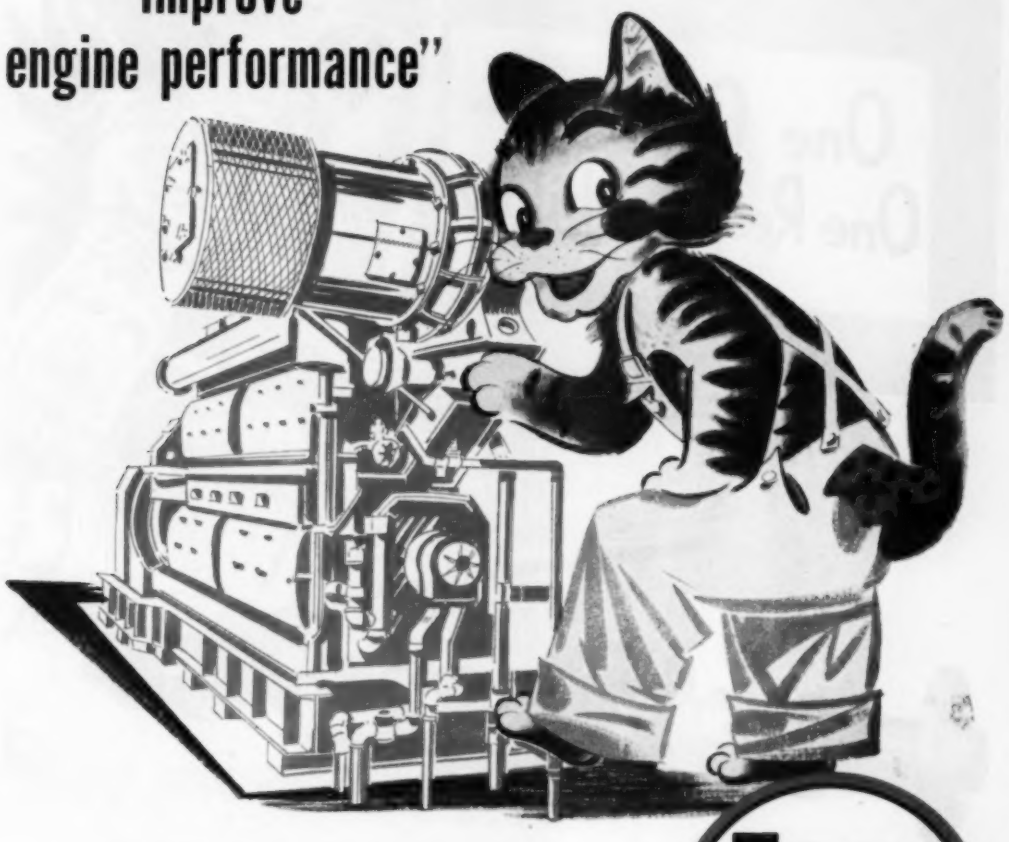
Dependable fuel injection equipment supplied by American Bosch is a vital element in making possible these profitable results.

Through its extensive research, development and field engineering—unrivaled precision manufacture—and its strategic network of service agencies—American Bosch plays a big part in bringing the advantages of dependable, low-cost diesel power to ever-expanding and diversified fields of application.

Dependable Fuel Injection for the Diesel Industry

AMERICAN BOSCH

"Tycol Diesel Oils assure free rings improve engine performance"



Certainly! Tycol Diesel Lubricants resist sludging, gumming and carbonization. They are made from specially refined, high quality bases, and offer outstanding stability. They have high resistance to heat and decomposition. They help diesels operate continuously . . . with maximum efficiency . . . and lowest maintenance costs.

There is a Tycol Diesel Oil scientifically engineered for every Diesel application – from high-speed units for industrial, railway and marine uses where a heavy-duty or detergent oil is necessary to low speed Diesels where a non-additive lubricant can be used.

Want to learn more about these fine oils – engineered to do the job better, at lower cost? Call or write your nearest Tide Water Associated office today.

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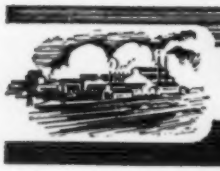
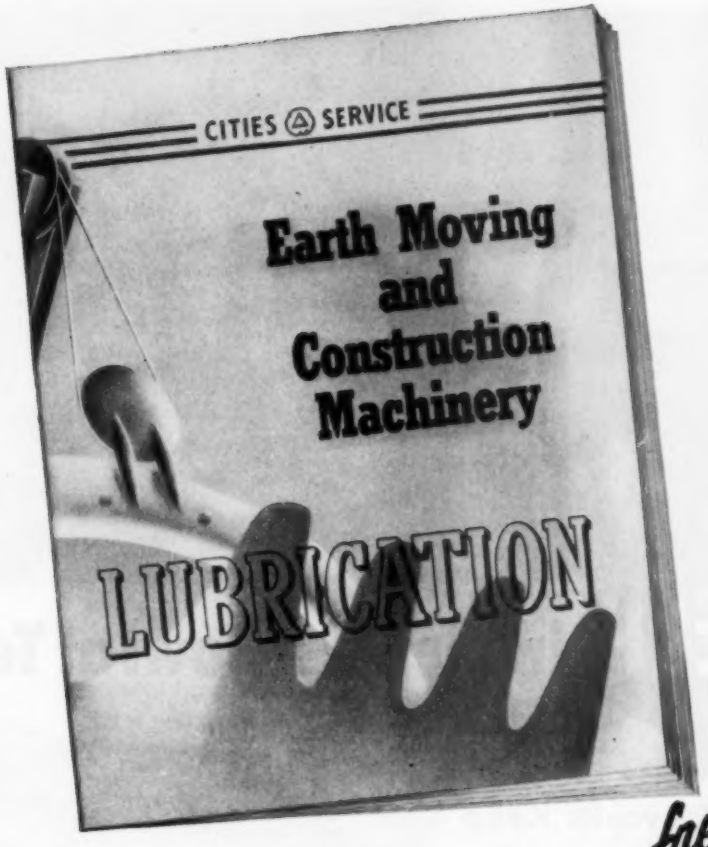
THE final result of this youngster's activity is entirely dependent upon his ability. That's the way we here at Erie Forge approach your problem—we take it over completely—One Control—One Responsibility. Every step—from raw material to finished crank is accomplished here. Design, metallurgical control, casting, heat treating, forging and machining are under the constant watchful supervision of fine craftsmen with many years of experience

Consult with us on your next requirements for crankshafts, connecting rods or allied items.



ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



Have you received your 1952 free edition?

FOR YEARS, men in construction and allied fields have found this lubrication book tremendously helpful. It not only discusses the basic fundamentals of lubrication, but it gets right down to specific lubricating techniques for all your equipment.

Proper use of the practices outlined in this book, plus the full line of Cities Service Quality Lubricants can:

- **Lengthen the life of your equipment.**
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If you're the boss and owner, it protects your investment, increases profits and simplifies your operations. If you're working for the boss, proper use of this book will help you on the job. Write now for your 1952 edition of EARTH MOVING AND CONSTRUCTION MACHINERY LUBRICATION, CITIES SERVICE OIL COMPANY, DEPT. 1-13, Sixty Wall Tower, New York City 5.

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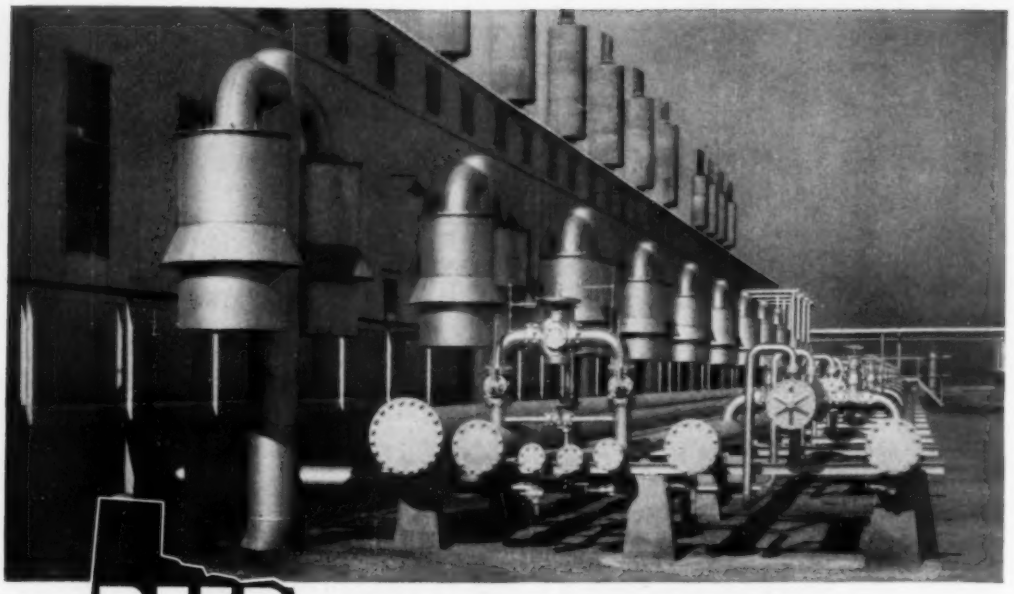

DEEP in the Dust Bowl of Texas

AAF Cycoils Keep Hungry Horsepower Grazing on Clean Air

There's 10,800 H.P. at work here! It's the Gulf Oil Corporation's Waddell Plant in Crane County, Texas, where nine 1200 H.P. Clark Brothers engines operate on an around-the-clock schedule.

Although dust is ever-present it's never a threat to the life and continued efficiency of these engines. Two AAF Cycoil Oil Bath Cleaners are installed at the intake of each engine to insure that *only clean air* reaches the vitals of this costly equipment.

Cycoil makes no "campaign promises" that it can't back up with proven performance facts. Its goal is perfection—100% cleaning efficiency. Over 90% of the fine dust content of the air is trapped by this unit before it even reaches the filter pads. Add to this, filtration of the dual filter pads plus positive oil circulation, and the outcome is approximately 100% clean air.

Cycoil dust protection costs only pennies compared to the dollars you would inevitably spend due to dust damage. Get the Cycoil story now! Write for Bulletin No. 130.

AAF **American Air Filter**
COMPANY, INC.

408 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

The tug "Titan", one of a large fleet owned and operated by Sabine Towing Company, Inc., Port Arthur, Texas. The "Titan" is reputedly the most powerful tug in the United States driven by a slow-speed, heavy-duty Diesel direct-connected to the propeller shaft. The engine has a high-pressure type Elliott turbocharger, for maximum power output.

ELLIOTT TURBOCHARGERS *help diesels make records!*

HERE'S ONE — The tug "Titan", as tough and powerful as its name implies, with its Elliott turbocharged Nordberg 1750-hp engine, *travels 33,370 sea miles in less than two years, with never a power failure.* This vessel handled some tough assignments, too, like bucking a hurricane off Louisiana, successfully hunting a drifting derrick barge, when all Coast Guard vessels were on other emergency errands, and no other vessel would venture out. Or towing a big, heavily loaded 15,000-ton tanker with engine trouble, all the way from Texas to Philadelphia — 1500 miles, at 7½ knots. It takes *power* to handle jobs like that—power that is packed in to the top limit of the engine by the Elliott turbocharger. It takes *endurance* too, another quality of Elliott turbochargers amply proved in thousands of applications covering four-cycle Diesels of all builders. Elliott turbochargers are now available in both standard and high-pressure types. Bulletin on request.

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M3-4

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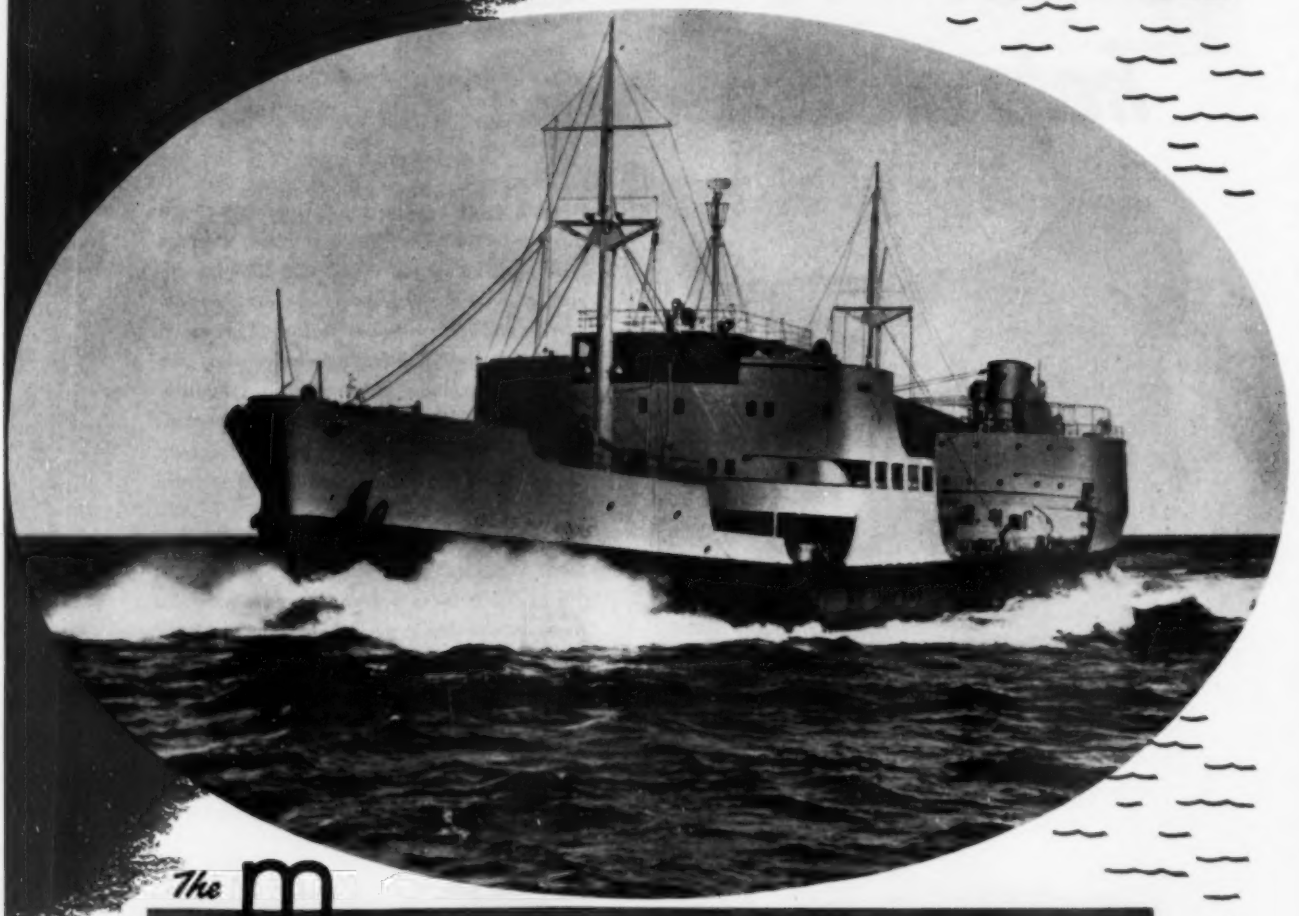
regulate the four Nordberg 465 HP auxiliary engines on

M/S ISLAS MALVINAS

... one of three Argentine Tankers built by Uddevallavarvet A/B, Sweden



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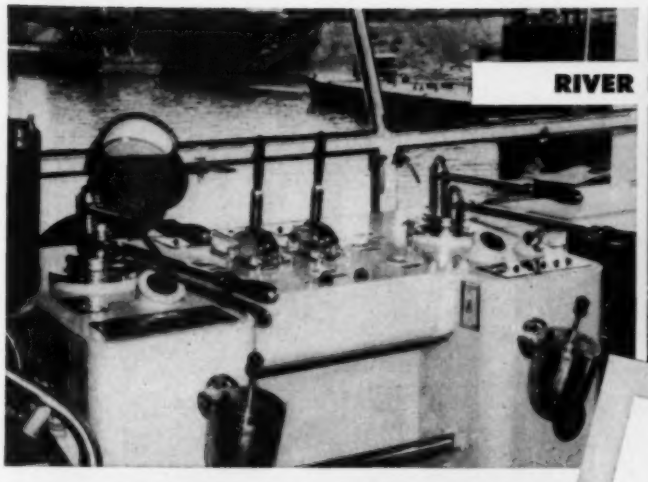
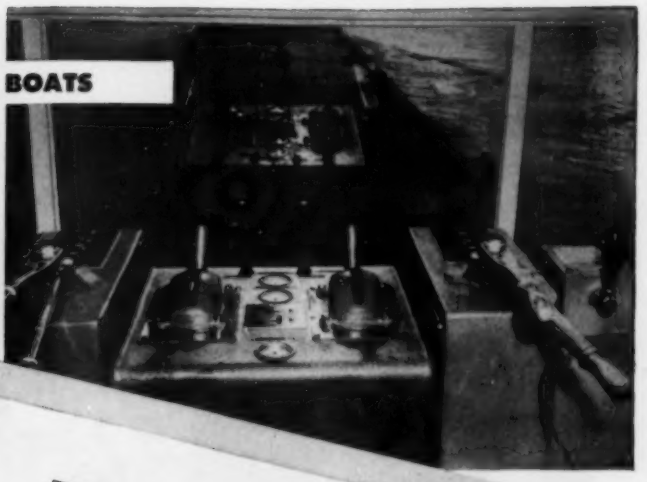
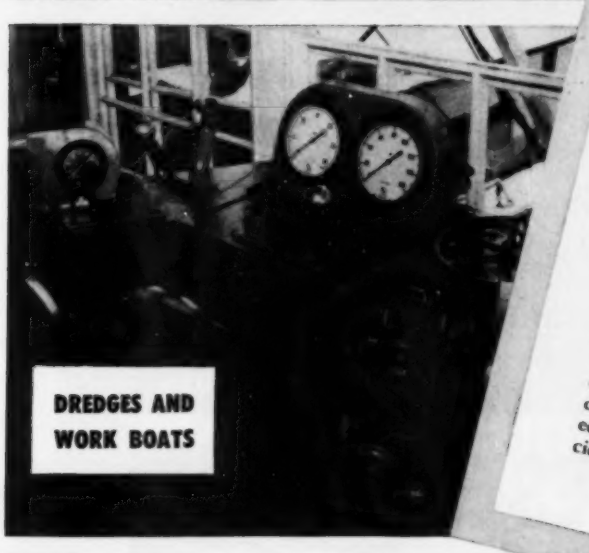


RIVER BOATS





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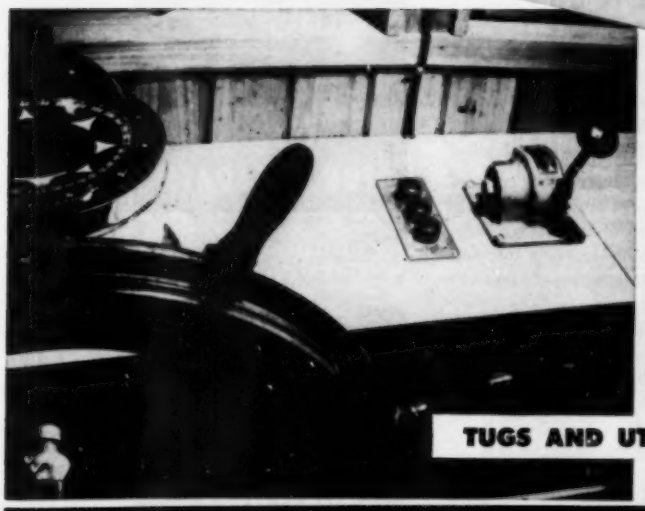
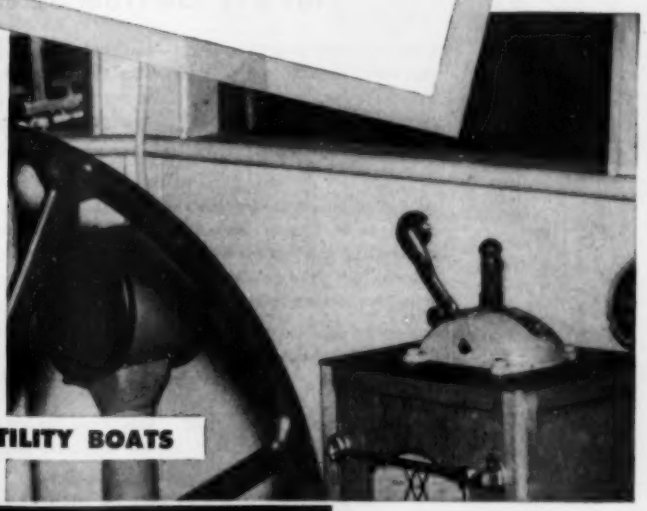
PNEUMATIC CONTROLS FOR *better maneuverability* OF MARINE VESSELS

• Put yourself in the pilot house of a boat equipped with W-A-B Pneumatic Controls and you'll quickly see their advantages. Their convenience and quick response give you much better maneuverability than other types of control.

You can get W-A-B Engin*aired* Controls for all classes of vessels from tugs to the largest river boats, dredges, ferry boats and military craft. They assure safe, economical navigation and help to eliminate costly accidents. Write for complete information.





TUGS AND UTILITY BOATS

MARINE SECTION

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AIR BRAKE COMPANY WILMERDING, PA.

INDUSTRIAL PRODUCTS DIVISION

Factory Branch: Emeryville, Calif.

Distributors throughout the United States . . . consult your Classified Directory.

Distributed in Canada by: Canadian Westinghouse Co. Ltd., Hamilton, Ontario.

THIS IS THE DIESEL

for any job from 32 H.P. up

When it comes to *pulling power*—and that means *paying power* in tractors, tugs and tillers as well as trucks—the General Motors 2-cycle Diesel is in a class by itself.

This engine's high torque output and rapid acceleration enable GM Diesel powered equipment to outpull and outwork other machines in *applications from 32 H.P. up.*

Producing power at *every* piston downstroke, instead of every other downstroke as do 4-cycle Diesels, the GM Diesel is smoother running, faster accelerating and more powerful for its size. It fits in approximately the same space as industrial gasoline engines of comparable horsepower—*and produces more power from less fuel!*

Ask your GM Diesel distributor to tell you how *this* Diesel can step up your production and cut your costs on mobile, portable or stationary installations.

Single Engines . . . 32 to 275 H.P. Multiple Units . . . Up to 850 H.P.

DETROIT DIESEL
ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN

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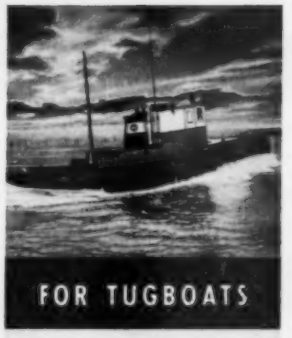
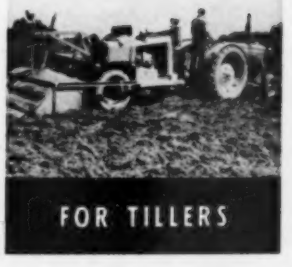
DIESEL POWER





STANDARD HD
TRADE MARK
OIL

Solves a fuel problem...

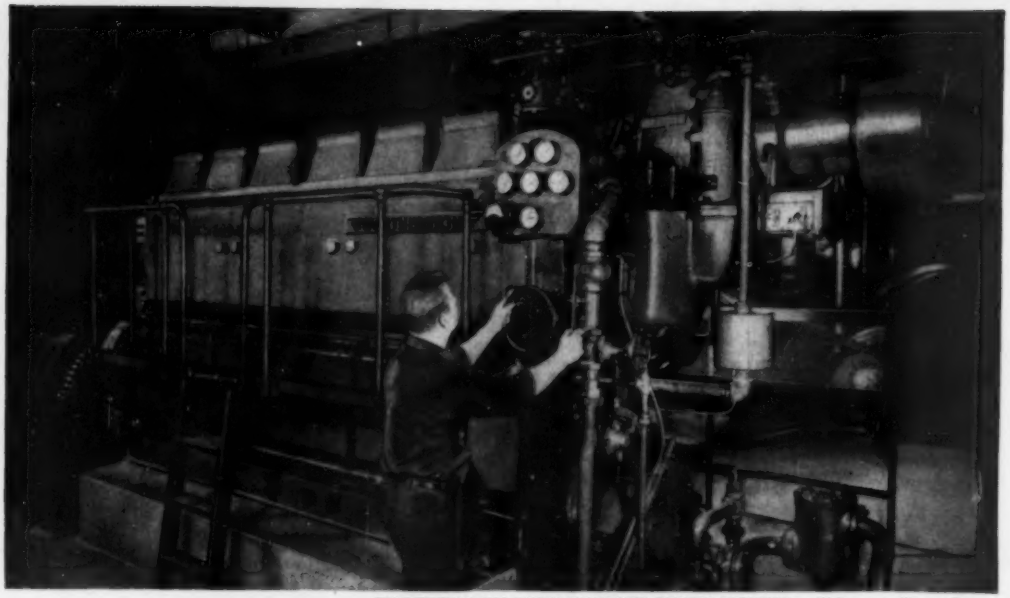
● The Center Municipal Power Plant of Center, Colorado, had a unique fuel problem. Because of the plant's rather remote location in the Rocky Mountains, the cost of transporting diesel fuel to the plant was extremely high. Resourceful Mr. Vail F. Shumaker, superintendent, worked out a plan for utilizing locally produced crude oil as a fuel. The poor burning quality of this fuel, however, led to trouble. Fuel soot was heavy and deposits formed in the plant's four engines. Rings began sticking.

A Standard Oil lubrication specialist was asked for advice. Upon his suggestion, the conventional lubricant used in the diesels was replaced in one engine by STANDARD HD Oil, a truly heavy-duty lubricant containing necessary additives. During the next few months' operation, this engine alone remained clean. It was evidence enough. The other diesels were switched to STANDARD HD. Despite severe operating conditions imposed by the poor burning fuel, STANDARD HD has kept these engines clean and protected during three years of service. It has made possible the use of the locally available fuel and thus effected a sizable saving for this power plant.

This plant's experience indicates how you can benefit through STANDARD HD and the services of a Standard Oil lubrication specialist. You can get those services easily and quickly by phoning your local Standard Oil (Indiana) office. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Pleased with performance of STANDARD HD oil are J. J. Tyler of Standard Oil (left) and Vail F. Shumaker, Superintendent of Center, Colorado, Municipal Power Plant, who worked closely together to solve a unique fuel-lubrication problem.

STANDARD OIL COMPANY STANDARD *(Indiana)*



WORTHINGTON SUPERCHARGED DIESEL ENGINE at Kalamazoo Paper Co., Kalamazoo, Michigan, driving 600-kw generator.

Kalamazoo Paper Co. guards against costly shutdowns with heavy-duty diesel generator

Company installs Worthington supercharged diesel and 600-kw generator for stand-by

An insurance policy against costly shutdowns! Such is the attitude of Kalamazoo Paper Company management towards the Worthington medium-speed, heavy-duty diesel they've installed for stand-by service.

Reason for their choice of this large heavy-duty unit was the reputation for absolute dependability that has been built up for these rugged Worthington engines over a period of years.

Let's look at some of the time-tested features that insure this dependability:

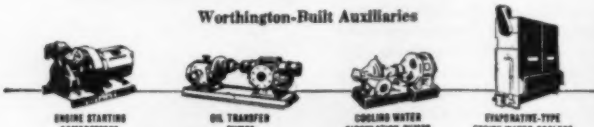
1. *Heavy cast-iron base and frame.*
2. *Steel forged crankshaft bedded in base.*
3. *Gear-driven camshaft.*
4. *Metal-to-metal fit between cylinder heads and liners.*
5. *Main bearings lubricated at bottom where pressure is greatest.*
6. *4-bolt connecting-rod bearing assembly.*

An insurance policy can be no better than the company that backs it. That's why before you buy, it will pay you to look carefully into the manufacturer's reputation.

It is by serving customers such as Kalamazoo that Worthington through the years has built a reputation for manufacturing long-lived, dependable equipment—a reputation that is backed in the heavy diesel field by the *longest experience* of any manufacturer of this type of equipment.

Feel free to call on Worthington for further details on diesel performance. We can meet all your engine requirements—oil, gas, or "dual fuel". Contact Worthington Corporation, Engine Division, Buffalo, New York.

Worthington-Built Auxiliaries



Economical Continuous Power— Diesel Engines, 150 to 2,100 hp . . . Gas Engines, 190 to 2,100 hp . . . Dual Fuel Engines, 150 to 2,100 hp.

WORTHINGTON
Engines

DIESEL and GAS ENGINE PROGRESS

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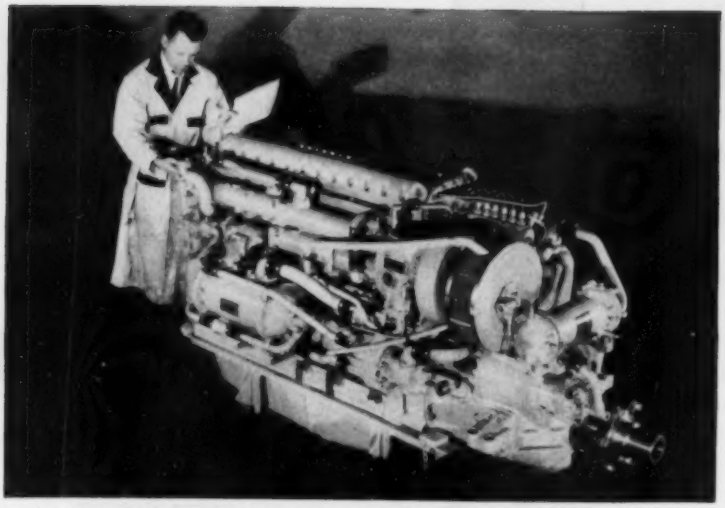
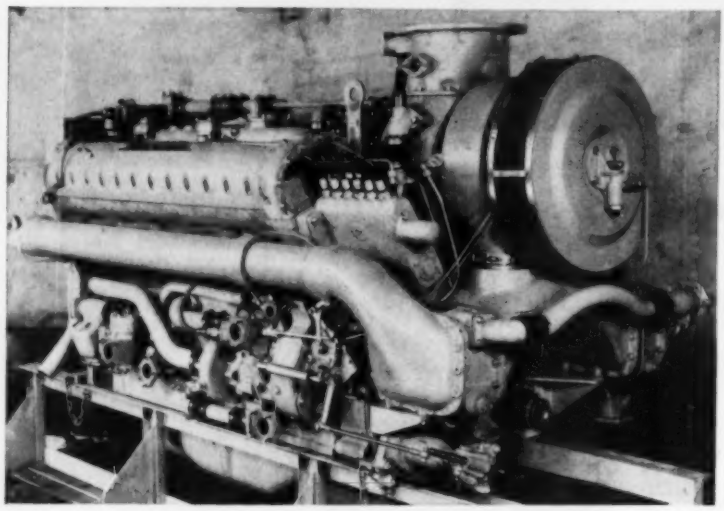
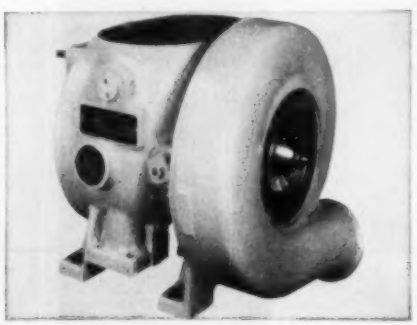


Packard's straight six-cylinder, 300 HP diesel engines use G-E Model 7SRA1-A1 Turbosuperchargers.

Greater Power and Economy For Diesels



Packard's new 600 HP V-12 diesel engines use G-E Model 7SRB2A1 Turbosuperchargers.



G-E Turbosupercharger Model 7SRA1A1 used on straight six-cylinder Packard diesel engine has brought about improved fuel economies, and has increased shaft horsepower for same fuel input.

Packard Diesels Equipped with General Electric Turbosuperchargers Open New Era in Diesel Design

The announcement of the new line of Packard diesel engines also introduces one of the first applications of turbosuperchargers on diesel engines of this size.

This application has resulted in many advantages over mechanical, gear-driven superchargers—advantages such as more shaft horsepower for same fuel input and the same IMEP, improved fuel economy at full load, and greater economy at partial loads.

General Electric has gained much experience during thirty years of development and production of aircraft turbosuperchargers and of the first high-pressure supercharger for locomotive diesel engines. Drawing on this experience, G.E. is continuing work on supercharger designs which will help give even higher levels of diesel-engine performance in the future. General Electric Company, Schenectady 5, N.Y. 294

GENERAL ELECTRIC

An aerial view of the loading dock at the terminus of the line in Superior, Wisconsin. The oil is pumped through the pipe line from the Alberta fields to this point, and then trans-shipped across the Great Lakes by tanker to refineries in Eastern Ontario.

THE INTERPROVINCIAL-LAKEHEAD PIPE LINE

THE Interprovincial-Lakehead Pipe Line is the first to carry Alberta oil across the border of Canada and the United States. Planned in early 1949 and put into operation in the winter of 1950-51, this 1,137-mile border-spanning pipe line transports crude oil from the prolific Canadian fields of Alberta to the Great Lakes at Superior, Wisconsin. From there it is shipped across the Lakes by tanker to Canadian refineries in Eastern Ontario. Not only is the whole system unusual for the international agreements worked out, but the equipment used on both sides of the border is identical. Heart of each station is its diesel pumping engines, which were designed by the American Locomotive Company. These diesel engines were built for stations in the U. S. section of the line at Alco's Auburn, N. Y. plant, and for the Canadian stations by Dominion Engineering Works of Montreal under a licensing arrangement with Alco.

Outside of a few small gathering lines in the Alberta fields, which were powered by small portable equipment, no major pipe line had ever been built or operated by Canadian personnel nor supplied by a Canadian manufacturer. Before proceeding with construction, Canadian engineers were sent to the United States to observe the experience gathered over the past fifty years of pipe lining in the middle west. Two problems presented themselves to these engineers—one was to obtain equipment of Canadian manufacture, and the other was to obtain the experience and "know-how" of American manufacturers who had been suppliers for the pipe line industry in the United States. This problem of pipe line transportation equipment was similar to the problem of the Canadian railroads. The railroads realized that diesel locomotives were necessary to their operations, but for financial reasons wanted them manufactured in Canada. The company with the most favorable facilities for manufacturing diesel engines of any size in Canada was the Dominion Engineering Works of Montreal.

Also at Montreal was the plant of the Montreal Locomotive Works, a Canadian affiliate of the American Locomotive Company. Agreement was entered into between Dominion and Alco to manufacture in Canada diesel locomotive engines of Alco design. These same engines would also be used for stationary operations.

American Locomotive Company has been supplying diesel engines to the pipe line industry since 1915, and has been furnishing its standardized 12½ in. x 13 in. engines for stationary use to pipe line companies and other industries since 1938. So the existing manufacturing arrangements for railroad diesel engines fitted very satisfactorily into the over-all plans of the oil companies interested in the transportation of crude oil from Alberta to the refining centers of the prairie provinces and Ontario. The oil industry of Canada obtained engines of Canadian manufacture, and by the same token they benefited from the experience of the American Locomotive Company with its "know-how" of pipe line pumping problems. Another item which governed this international arrangement was the fact that while there were two separate companies—Interprovincial Pipe Line Company in Canada and Lakehead Pipe Line Company in the United States—the operation of this system would in effect be one, and the personnel would probably be transferred at various times from Canadian stations to stations in the United States, and vice versa. Also parts for this equipment might be shipped across the international border for use in maintainence or for emergency use. Last, but not least, was the fact that one station design could serve both the Canadian and the United States sides of the line.

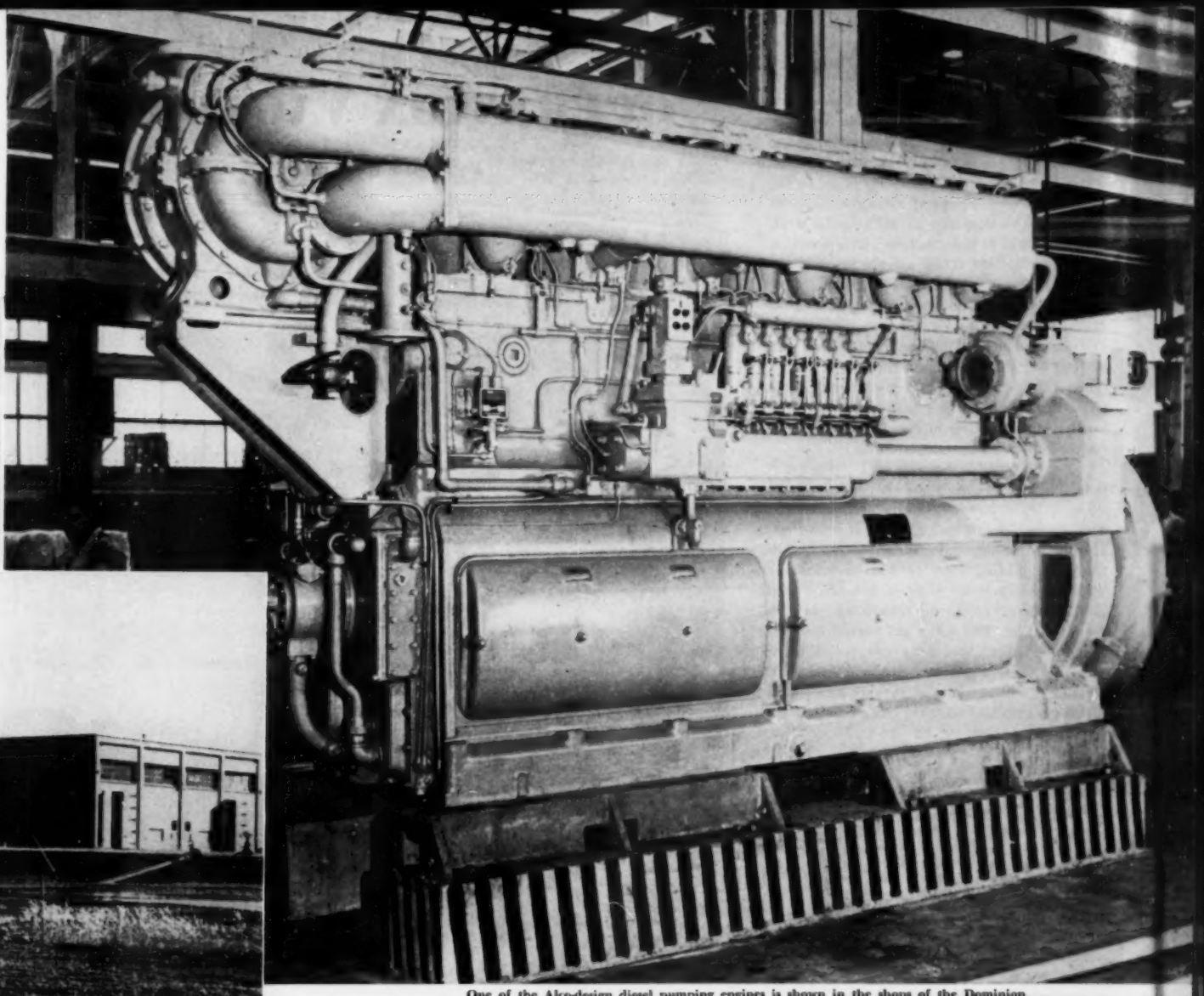
The pipe line was originally designed for pumping operations at 200 mile intervals. Initial stations were built in Edmonton in the middle of the Alberta oil and gas fields; Kerrobert and Regina, Saskatchewan; Cromer and Gretna, Manitoba; and a single U. S. Station was located in Clearbrook, Minnesota. Soon after the line was put into operation it was found that capacity increase required 100-mile spacing of stations making it necessary to construct additional facilities at Hardisty, Alberta; Loreburn and Glenavon, Saskatchewan; and Glenboro, Manitoba. One new station has also been built in the United States at Viking, and another is being built at Deer River, Minnesota. Thus, the line is now served by nine stations in Canada and two in this country, with a third under construction. Each station is equipped with either two, three, or four pumping units connected in series. In Canada these units are either 6 or 8 cylinder, Dominion-Alco 12½ in. x 13 in., dual-fuel or straight diesel engines, while the U. S. stations are equipped with Alco built diesels of the same design. All stations are similar, except for size and number of pumping units employed, even down to the emergency shut-down device for operation from outside the building.

The American Locomotive Company has made as few changes as possible in their standard engine in adapting it for crude oil pipe line service. Its experience in supplying engines for this use has demonstrated that the injection equipment must be of special material. Also it has been found that the pistons should preferably be of cast iron, whereas the standard engine, when using refined oil, is equipped with aluminum pistons. All other items —that is, the bearings, valves, crankshafts, lube oil systems, etc.—are the same as on the many thousands of switching locomotives and the many hundred stationary installations using this same 12½ in. x 13 in. engine. Due to the fact that these stations are located in isolated places, and are required to operate at temperatures as low as 50° below zero and as high as 90°F., the entire station is in one building, protected by fire walls and other devices.

The crude fuel oil is taken from the transportation line and is brought into a settling or rest tank, from which it is pumped to the centrifuges, and from there through filters to the engine day tanks. These centrifuges and storage tanks are set up on a continuous system. The spill from the centrifuges is put back into the pipe line and sent on to the refineries. The injection system on both the dual fuel and straight diesel engines is typical Bosch with a long helix, and oil-cooled Bosch nozzles—all parts made of cororsion resistant steel. The units drive centrifugal pumps through step-up gears with a ratio of aprpoximately 6:1, the gears in Canada being furnished by Dominion Engineering, and in the United States by Farrel-Birmingham of Buffalo.

The Gretna, Manitoba, pumping station of the Interprovincial Pipe Line is a typical installation.

The main line pumps, which operate in series, were furnished in Canada by the Canadian manufacturing concern licensed to build pumps of Byron-Jackson design, while the pumps in the United States were furnished by the Bingham Pump Company of Portland, Oregon. Due to the fact that tankers cannot operate from Superior for about five months out of the year, the stations must operate over a wide range of capacity—as low as 40,000 barrels per day in the winter, and ultimately up to 135,000 barrels per day in the summer time. All this is done by varying the speed of the engines



One of the Alco-design diesel pumping engines is shown in the shops of the Dominion Engineering Works, Montreal, prior to shipment to Interprovincial.

and cutting engines off at various stations. Some, in fact, are completely shut down.

The Interprovincial-Lakehead Pipe Line is operated on the closed line system, and its flow is automatically controlled by the pumping rate of the Edmonton station. This requires that all stations and sections of the line pump at the same rate, except where streams are added or withdrawn. To carry out this operation efficiently, each station is automatically regulated to maintain a predetermined suction and discharge pressure. Closed line operation is a recent departure from the float tank operation wherein each station and its down stream line operates as a single unit, increasing or decreasing the throughput to maintain a constant stock in the float tank. Each station is equipped with pneumatic controllers connected to the suction and discharge sides of the line. These controllers are in turn pneumatically connected to individual diaphragm motors located on each governor. If the suction pressure decreases, the suction controller automatically signals the speed controllers. This causes all diaphragms to slow down simultaneously, thus decreasing the pumping rate until proper suction pressure is restored. The discharge controller is set to override the suction controller and is capable of reducing engine speed in the event of excessively high discharge pressure. Woodward-type P.G. governors and Taylor pneumatic controls were selected for this application.

The cooling system, in keeping with modern pipe line practices, incorporated an individual system for each unit. The water circulating pump is built integral with the engine and the heat from the jacket water and the lube oil is dissipated through a shell and tube heat exchanger to the main oil stream. By suitable temperature controls, part of the water is sub-cooled for use in the lube oil coolers of both the engine and the step-up gear, and then blended back into the engine jacket system, so that the maximum temperatuer range across the engine is less than 15°. Both the lube oil and jacket water coolers are of vertical design, which allows the tube bundles to be serviced very readily with the aid of the overhead driving crane in both the pump room and the engine room. Strange as it may seem to pipe liners in the United States, the pump room crane is heavier than the one located in the engine room, because all manifolding and large gate valves are inside the pump room.

Throughout the design and operation of this international pipe line, the matter of standardization has been uppermost in the minds of the operators and designers, and they are particularly fortunate in being able to obtain engines on both sides of an international border which are interchangeable throughout. All pipe line companies are faced with the problem of interchangeability and standardization. It is only by adopting mass-produced equipment that any degree of standardization can be obtained which will guarantee the purchaser many years of low-priced, quickly-obtained renewal parts.

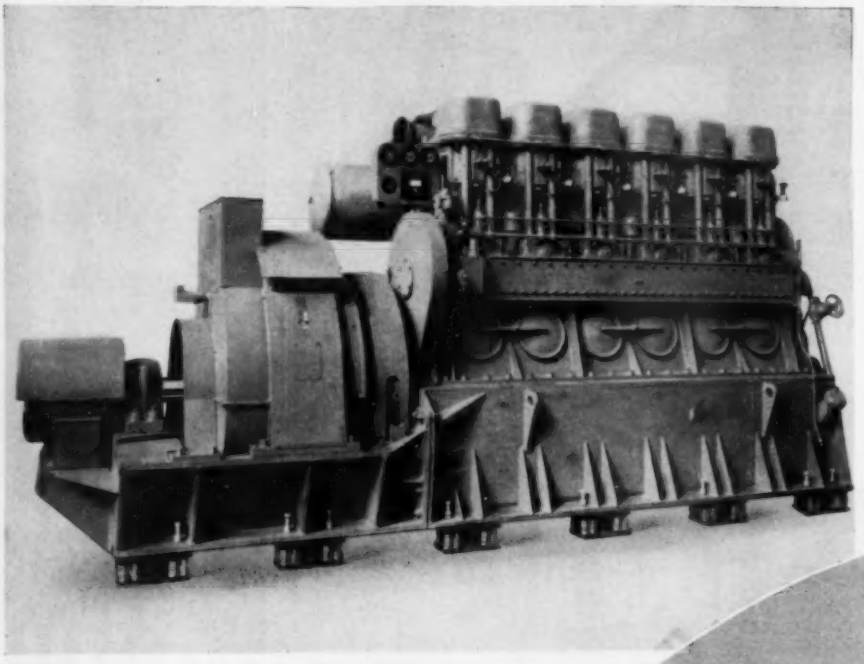
OPERATION VAGABOND

By OMER HENRY

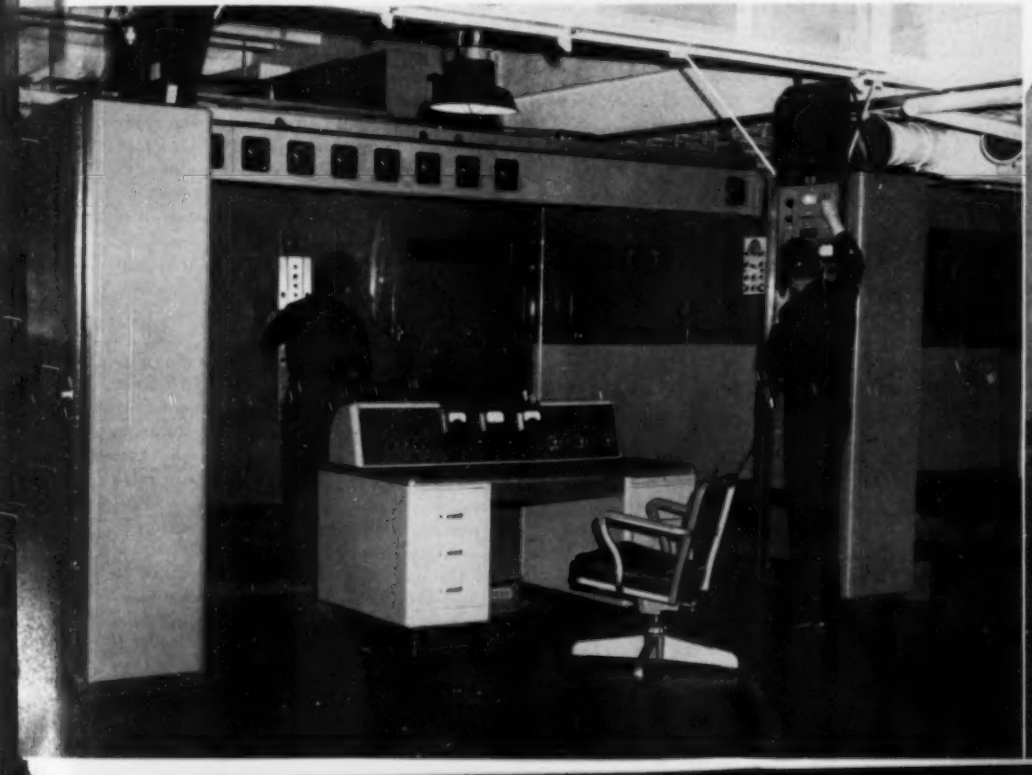
DIESEL engines have produced one impressive record after another since the turn of the century. In 1925 they introduced diesel switching locomotives to American railways. Six years later they provided power for an airplane flight. In the same year a diesel-equipped automobile covered the 500 mile nonstop race in Indianapolis at an average speed of 98 miles an hour and topped that by 39 miles in 1935. These are but a few of the spectacular diesel performances which have revolutionized transportation by land, water, and air around the world. But now diesel has undertaken a project a thousand fold more monumental than all that has gone before it. The undertaking is global in scope. If successful, it may change world history for it strikes at the heart of the East-West conflict by attempting to carry the story of democracy into Iron Curtain countries.

Communist governments are the adversaries. In Western ideas they see threats to communism's continuance and expansion. For that reason they attempt to prevent radio listeners in their countries from hearing Voice of America broadcasts. The less the comrades know of democracy, Communist officials appear to reason, the easier to regiment them. The Soviet has learned that jamming the radio waves is an effective means of blocking VOA broadcasts. Jamming consists of creating a wall of radio interference between the sending station and receiving set, a relatively simple matter.

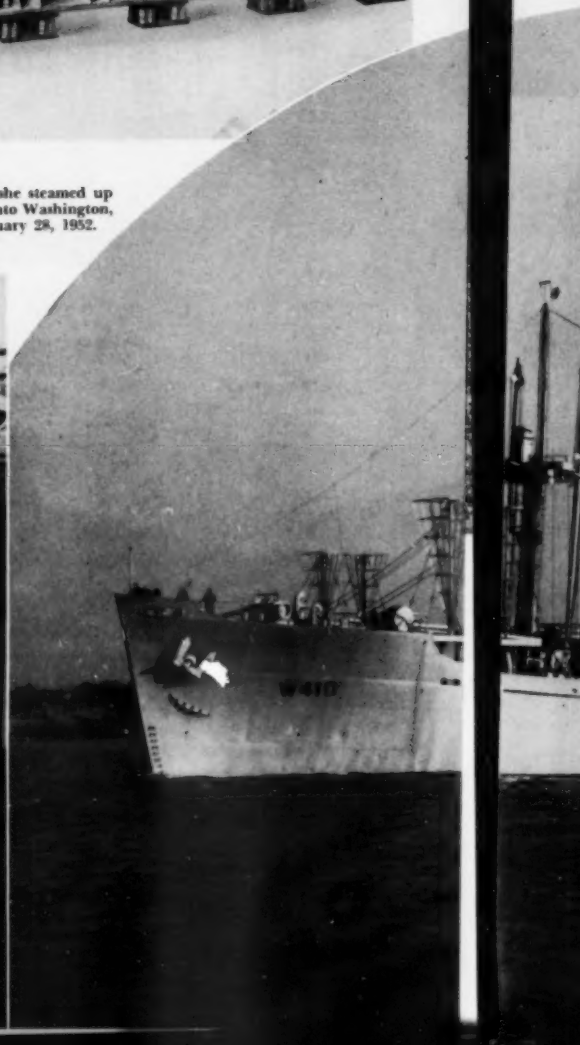
A jamming station does the trick. It is a broadcasting station operating on the same wave length as the station whose program is to be blocked. It transmits noises. The result is that the receiving sets within its range emit only an assortment of sounds so scrambled to be wholly unintelligible. Russia has constructed a number of such stations at strategic points in an effort to prevent citizens of the Soviet and satellite countries from hearing VOA messages. It is evident, therefore, that Stalin fears these programs, else he would never have erected scrambling stations. It follows, too, that if VOA broadcasts can get into Communist countries,



One unit of the *Courier's* auxiliary power—750 hp. direct drive Baldwin diesel.

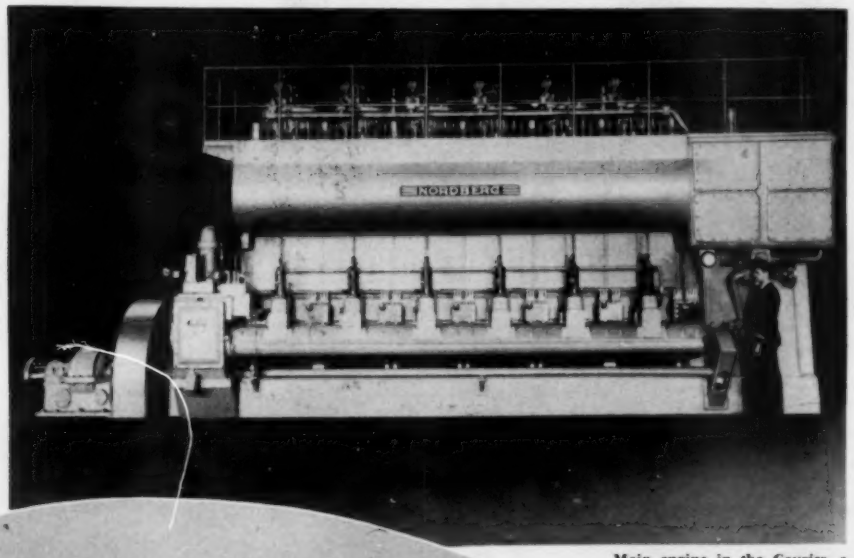


In the center (foreground) is the master control console. The operator standing at the right is taking frequency and audio measurements on one of the two control test racks, while the operator at the left makes adjustments at the 150 kw. transmitter, three times more powerful than that of the largest American broadcasting station.



The *Courier* as she steamed up Potomac River into Washington, D.C., on February 28, 1952.

they may produce world-shaking repercussions. American radio engineers, with their usual ingenuity, have devised a scheme to counteract Soviet radio wave jamming. President Truman and the Joint Chiefs of Staff have approved the project which is known as Operation Vagabond. It has certain components involving the use of diesel engines. One of these is a 5,800 ton ex-Coast Guard cutter 338 feet long, the *Courier*. In dedicating it to its present task the President remarked: "This ship is named the *Courier*. It is well named, for it will be carrying a message. It will be carrying a message of hope and friendship to all those who are oppressed by tyranny; it will be carrying a message of truth and light to those who are confused by the storm of falsehood that the Communists have loosed upon the world." The *Courier* carried a floating broadcasting station, the only one in the world. More accurately, it is a relay station. It does not originate programs but picks up those broadcast in the United States and beams them into target countries. It is equipped with a small studio and control center so, should the occasion arise, its 10 officers and 80 crewmen could produce and broadcast its own programs.



Main engine in the *Courier*, a Nordberg 6 cylinder, two cycle powerhouse that is playing a star role in the East-West drama.

Just as the jamming station must be stronger than the station it jams, so the *Courier's* transmitters must be more powerful than those of the Communists' jamming stations if they are to make VOA messages audible in Iron Curtain countries. To comply with this requirement, the *Courier's* transmitting equipment is the most powerful of its kind ever installed on a ship. It consists of one 150,000 watt medium-wave transmitter which is three times as powerful as the largest commercial transmitter in America. In addition there are two 35,000 watt short-wave transmitters and supporting communications equipment on this ship.

The transmitter power comes from two 230 volt, 250 kilowatt Westinghouse dc. generators each of which is driven by a direct drive Baldwin VO type diesel engine. Together these furnish current enough to permit the *Courier* broadcasting station to out-blast by far any Soviet interference. The design of this engine incorporates every successful advance in 4 stroke diesel engine development. Its maximum speed is 625 rpm.—minimum 360. For continuous, heavy duty service its usual speed is 514 rpm. With six cylinders, 12¾ in. bore, and 15½ in. stroke, this engine will develop 750 horsepower. A turbulence combustion chamber in each cylinder head allows the injection of fuel over a relatively long period at low injection pressure. This results in gradual combustion pressure rise and unusually low maximum firing pressures. These features produce exceptionally smooth performance and relatively quiet operation. The engine is not sensitive to variations in fuel oil characteristics, injection pressure, and injection timing. A water-cooled combustion chamber, separated from the cylinder proper, provides, to a large extent, protection from combustion heat for the piston rings and exhaust valves.

The *Courier* is propelled by a six cylinder, 21½ in. by 29 in. Nordberg two cycle engine which delivers 1,700 shaft horsepower at a speed of 180 rpm. This engine is of trunk piston construction with attached scavenging pump driven from a crank on the crankshaft. Mechanical injection is used. The engine is started, stopped, and maneuvered from a single lever located at the forward end of the engine convenient to the fuel pumps, cylinder lubricators, and gauge board.

Simplicity of design and accessibility of all working parts are salient features of these diesels which are playing star roles in the East-West drama. Both the Baldwin and Nordberg engines have established excellent records in heavy duty marine service because of their rugged construction and ability to withstand severe usage. Too, the *Courier* is movable whereas jamming stations are not. Since a jamming station is effective only in a given area, the *Courier's* mobility gives it a marked advantage over the Communists' interference stations. Although capable of broadcasting from the open sea, the *Courier* is scheduled to operate while anchored at undisclosed locations. It may use either land-based antenna or antenna supported by a captive barrage balloon filled with helium. It carries a

supply of balloons 69 by 35 feet in size and 150,000 cubic feet of helium. A winch under the flight deck spools the balloons in and out.

The *Courier* was developed to provide maximum mobility and 24-hour all weather operation. The ability of the vessel to shift operational areas as required and to remain in one place as long as needed is expected to open new listening areas to VOA. Unarmed with guns or any instrument of destruction, the *Courier's* mission is not that of a battle ship. Instead of bombs it carries a cargo of truth. Its job is to wage a campaign of truth—to bear to the peoples of the world, to those who are free and to those who are not free, the truth about what is happening in the world today. "It carries a message of friendship," President Truman assures the world. "For almost two centuries the people of the United States have lived at peace with the people of Russia, China, and other countries whose rulers are now assailing us. Only a decade ago, when the people of Russia and China were suffering under two of the most savage invasions in history, we came to their aid. We helped them save their countries."

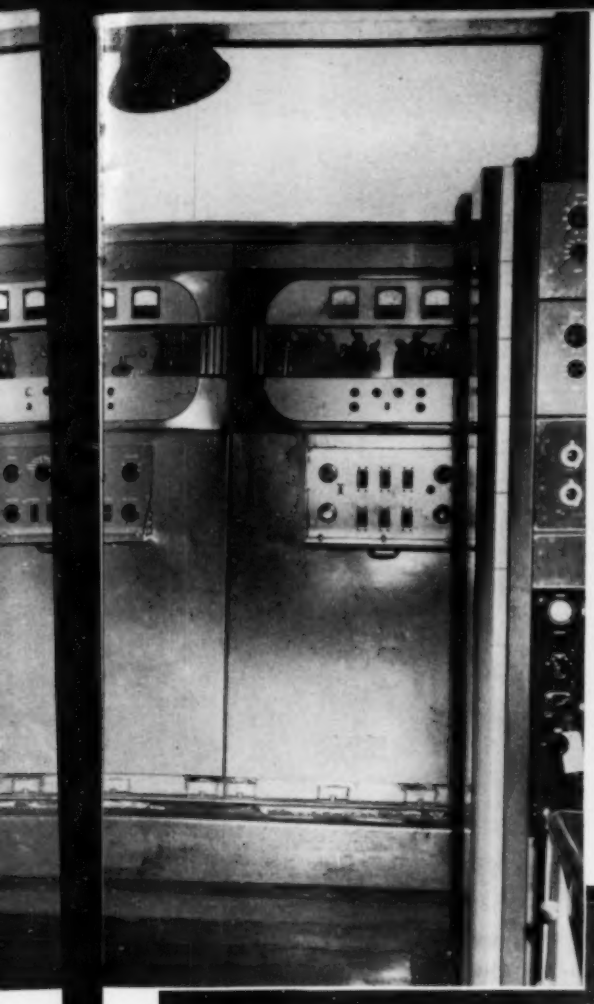
Such ideas disseminated in Iron Curtain countries are calculated to check the spread of communism. "We are your friend," President Truman declared

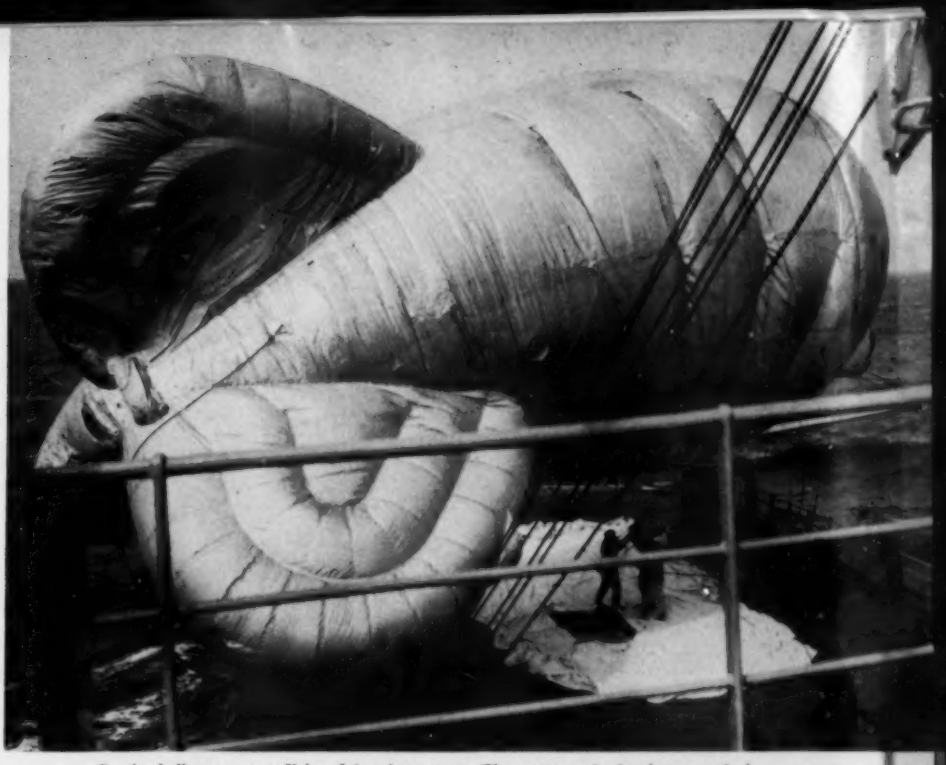
In the program control room on the superstructure deck of the *Courier*, seagoing transmitter manned by the U. S. Coast Guard and sponsored by the State Department for Voice of America broadcasts, Edwin L. Brusstar, Jr., of Philadelphia, Pa., is seated at the control panel. At his right is a playback from which programs are fed to the transmitters.

One of the 35 kw. high frequency transmitters in the transmitting room aboard the Coast Guard-manned *Courier*.

over the *Courier* transmitter from Washington. "There are no differences between us that cannot be settled if your rulers will turn from their senseless policy of hate and terror and follow the principles of peace. Your government, with its newspapers and radios, may try to make you believe that the United States is a hostile country, bent on war. But that is not true. I want you to know that our highest aim is peace and friendship—and an end to the horrors of war."

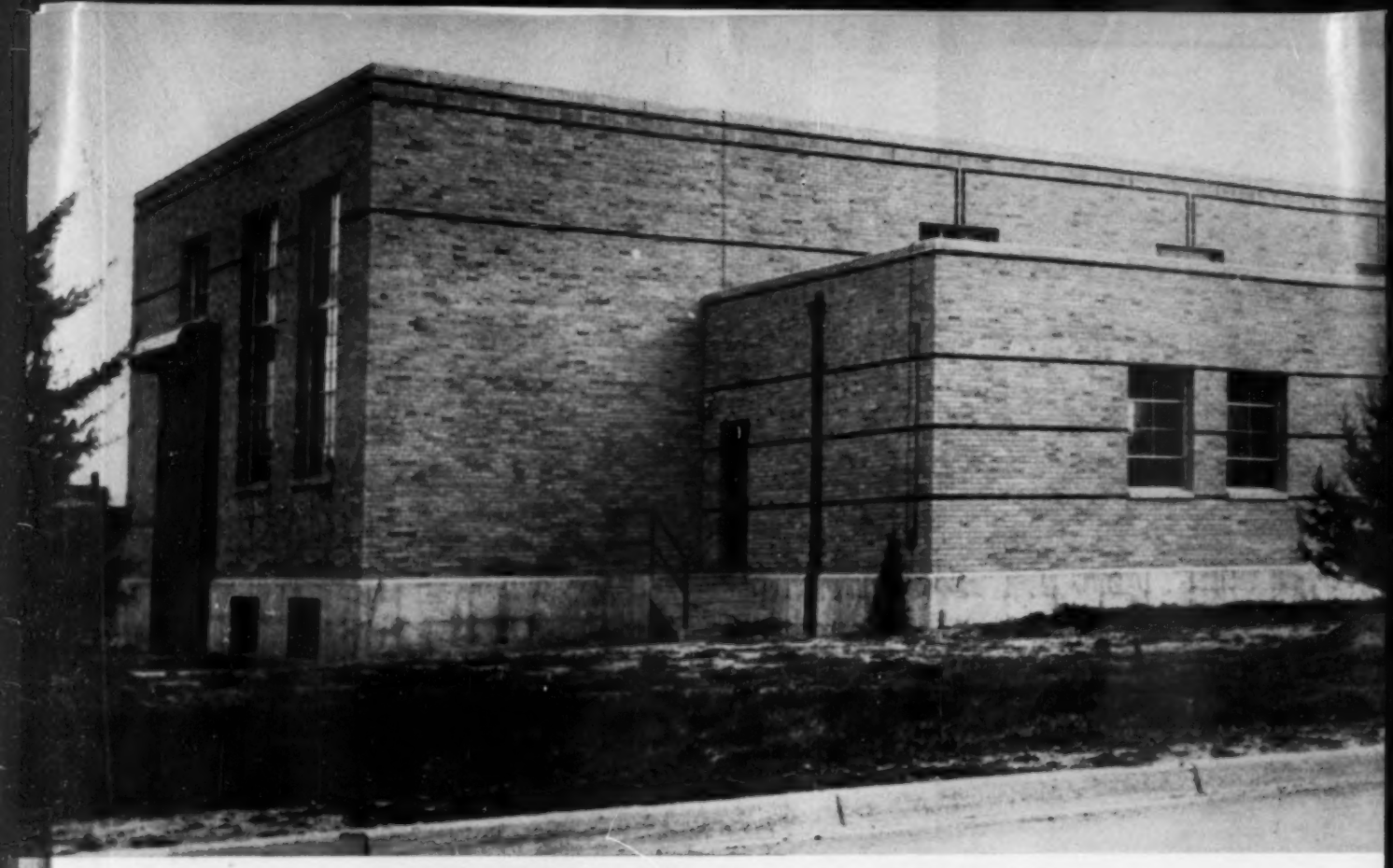
It is difficult to estimate the importance of Operation Vagabond. Should it contribute to the turning of the tide against communism—which controls more people than the Christian religion including all Protestant denominations, the Catholic church, and the Jewish faith combined—it would materially affect world history for centuries to come. Whatever the outcome, the *Courier*, a relatively small ship, is charged with tremendous significance. It will carry on the fight for freedom in the field where the ultimate victory must be won—in the minds of men. Diesel engines, by supplying power both to propel the *Courier* and beam broadcasts into Iron Curtain countries, are doubtless engaged in one of their most momentous projects to date. And, in the traditional diesel fashion, they are doing an excellent job. All illustrations used in this article are official U. S. Coast Guard photographs.





Captive balloon supports Voice of America antenna. The antenna wire has been attached, and the balloon is ready for release. The Coast Guardsman will control the ascension with guy lines until the balloon has cleared the superstructure of the ship.

President Harry S. Truman (second from left) inspects part of the powerful 150 kw. transmitter aboard the *Courier*. Others are (left to right): Dr. Wilson Compton, International Information Administrator; Capt. Oscar C. Wev, USCG, Commanding Officer of the *Courier*, and Jean Seymour, project engineer.



Beloit, Kansas, Builds New Power and Water Plant, Installs Two 2,100 Hp. Fairbanks-Morse Dual-Fuel Engines in Municipal Showplace

BELOIT, KANSAS

By W. H. GOTTLIEB

THE City of Beloit, Kansas, has constructed a new power and water plant that is destined to be one of the municipal showplaces of the midwest. The plant is notable for its attractiveness inside and out. It is notable for its sound engineering, the quality, completeness and arrangement of equipment. Finally, it is notable for its two new 2,000-hp. Fairbanks-Morse dual-fuel engines which are generating power for a total fuel cost of just 3.71 mills per kwh., a saving of more than 58 percent. This community of 4,000 population in the heart of the rich farmlands of the Solomon Valley, has operated municipal utllities since 1908 when the city purchased the privately-owned steam plant which had served local needs for 20 years. In 1927, the city turned to diesels with the installation of a 600-hp. air-injection McIntosh & Seymour diesel. Another identical unit was installed two years later and, in 1930, a similar engine rated at 675 hp. was added to the plant. For the next full decade, these three engines carried the developing load. Then, in 1940, the city purchased a mechanical-injection Alco diesel rated at 1,080 hp. at 600 rpm. A second unit of the same size and type was installed six years later.

With this last installation, the old plant reached the limit of practicable expansion since it was wedged in between railroad and river and shared this limited space with the old water plant. Another disadvantage of the original site was its low elevation, 2 ft. below a recorded flood level. After a study of the power and water utilities and probable future requirements, Wilson & Co., consulting engineers, recommended that the old plant be abandoned and a new modern structure be built on higher ground. The recommendations were approved, a bond issue was voted, and a completely new water treatment plant and power house were constructed on ground 15 ft. above flood level. The three oldest engines were considered too small and, by modern standards, uneconomical to justify moving them to the new plant and continuing them in service. All three had been completely charged off the books. The two 1,080-hp. diesels were to be reinstalled in the new plant but their combined capacity of 1,500 kw. was much too low to handle a load which had reached a peak of 1,770 kw. in 1948. Obviously, major expansion of generating capacity was essential, not only to provide firm capacity for immediate needs but to allow for normal growth in power consumption.

At the same time, it was decided to utilize the available source of cheap natural gas and to install gas-burning engines capable of carrying the entire load. The engines chosen were two identical Model 31AD18 Fairbanks-Morse dual-fuel units. Each has six cylinders, 18-in. bore and 27-in. stroke, and is rated at 2,100 hp. at 277 rpm. Each drives directly a 1,875 kva., 1,500 kw. 3-phase, 60-cycle, 2400/4160 volt Fairbanks-Morse alternator with 20-kw. belted exciter. The power equipment was installed in the new plant during the spring of 1951 and was called on ahead of schedule to prove the wisdom of the choice of site. In July, the river rose out of its banks and flood waters threatened the old plant which still was carrying the city load. A sand bag dike was constructed to protect the plant but it

Beloit's new plant is a municipal showplace housing the city's power equipment (the main section visible in this picture) and a water treatment plant (in the section beyond the main entrance at extreme right.)

soon became apparent that the raging waters could not be held. The new engines fortunately were in condition to run and were pressed into emergency service on July 15th. One hour later, the river broke through and flooded the old plant.

Operating conditions for the first months of operation of the big engines were not conducive to maximum efficiency, yet the dual fuel units gave solid evidence of the substantial savings in prospect for the new plant. In the first three months, the new No. 1 engine ran 989 hours and produced 656,000 kwh. The No. 2 engine ran 982 hours and generated 657,000 kwh. This meant an average load under 50 percent of engine capacity. Yet, the dual-fuel units produced the 1,313,000 kwh. with an expenditure of $3,474.90 for natural gas and $1,412.61 for pilot oil, a total of $4,887.51. In mills per kwh. the picture was as follows: Natural gas, 2.64 mills; Pilot oil, 1.07 mills; Total fuel cost per kwh., 3.71 mills. In the year 1950, the city's oil-burning engines produced 6,909,400 kwh. on 565,416 gal. of fuel. At today's fuel price of 11 cents a gal., this would mean an expenditure of $62,305.76 or an average of 9.01 mills per kwh. Thus the use of the new dual-fuel engines rather than the old diesels has meant a saving of 5.3 mills per kwh., a fuel cost reduction of more than 58 percent. With development of a more favorable load factor, the fuel consumption of the dual fuel units will be lower and savings correspondingly greater. One of the 1,080-hp. engines is being converted to dual-fuel operation which will increase the flexibility of the plant and permit more efficient load factors for all the dual-fuel units. The other 1,080-hp. diesel will serve primarily as a stand-by engine. Savings in fuel will be the biggest dollar benefit realized from the new plant but there will be additional savings in lubrication and maintenance costs which were understandably high in the case of the old engines.

Beloit's new power plant was designed with foresight and meticulous care both in structure and equipment to give the city a civic building it could be proud of and to give the operating staff the means for smooth, efficient operations. The spacious, modern brick building, set in attractively landscaped grounds, houses the water treatment plant and the large power plant which has room for three additional engines. All accessory equipment is in the basement and all possible maintenance work is done in the basement so that the engine room floor is always clear. For operating ease, accessory equipment may be controlled from panels in the engine room.

All engine foundations are independent of the floor to avoid transmission of vibration. All rails around engines or other equipment are fabricated from 1¼-in. thin-wall tubing and are so light that they can be lifted out easily to permit access for maintenance. The 3-ton crane, controlled electrically from the floor, operates the full length of the building. The truck loading dock is inside the building so that the crane can be used to unload the vehicles and place articles in either engine room or basement. The entire plant was painted in accordance with a "color dynamics" plan recommended by color technicians after a study of plant operating problems and equipment. Aside from its decorative qualities, the color code for all equipment and piping assists in identifications and safety.

The plant has its own railroad siding from the main Union Pacific line and the 36-38 gravity fuel oil is unloaded from tank cars by a motor-driven 2-in. rotary pump and stored in two 20,000-gal. tanks. Two 15,000-gal. tanks are to be moved up from the old plant to give a total capacity of 70,000 gal. A pair of motor-driven transfer pumps move oil from storage through filters, strainers and meters to individual 500-gal. day tanks in the plant basement. As a safety feature, the transfer pump will run only while the operator keeps his finger on the button. The day tanks also are equipped with high and low level alarms. Built-in, engine-driven supply tanks pick up fuel from the day tanks and deliver it through another set of filters to the dual-plunger injection pumps of the big F-M dual-fuel engines. These injection pumps supply a small accurately metered charge of pilot oil to initiate combustion of the natural gas during dual fuel operation. If gas supply fails for any reason, the governor automatically calls the large-volume plungers into service and the engine functions as a full, oil-burning diesel. Natural gas comes to the plant from the gas company's main measuring station via a 4-in. line. At the plant, the gas

passes through a pair of meters at 35 lb. into a header, then through a tap line to an individual meter for each engine. There is a bypass line so that the gas supply need not be interrupted in case of meter failure.

A detergent-type lubricating oil is circulated to bearings and pistons of each F-M engine by a built-in, engine-driven pump. Included in the main circuit are a strainer and an oil cooler with thermostatically-controlled bypass valve. Oil is drawn continuously from the pressure system through a 10-cartridge cellulose-type filter and then returned to the crankcase. The auxiliary lube pump, driven by a 20-hp. motor, has sufficient capacity to serve as a standby for the main pump in addition to its regular duties in starting and stopping the engine. The cylinders are supplied with lube by a pair of force-feed, mechanical lubricators which draw their oil from the main crankcase supply. The plant has a convenient arrangement for adding makeup oil to the crankcase. An air-driven pump is attached to the oil drum in the basement and lube is pumped through a hose to the engine filler pipe. Flow is controlled by the operator at the nozzle and a built-in meter at that point shows the gallonage pumped.

Each engine has a separate jacket water circuit including a 5-in. centrifugal pump driven by a 15-hp. motor, and a shell-and-tube heat exchanger with automatic thermostatic bypass valve. The jacket system for each big engine holds 350 gal. of water. All the exchangers are tied to 10-in. raw water headers. The raw water is circulated through the exchangers and through an induced-draft cooling tower by a pair of 1250 gpm. turbine pumps driven by 25-hp. motors. It is possible to bypass the tower if desired and there are two screens in the pump suction sump so that one may be cleaned while the other remains in service. The raw water system holds 12,000 gal. Scavenging air for each of the big 2-cycle dual-fuel engines is drawn through a two-unit oil-bath filter and an intake silencer to the engine's built-in scavenging blower. Exhaust gases pass through vertical silencers outside the plant. All exhaust lines are insulated. Starting air is provided by a 15 cu. ft. compressor driven by an automatically-controlled motor which keeps pressure between 200 and 250 lbs. An air header runs the length of the plant with a line to each engine.

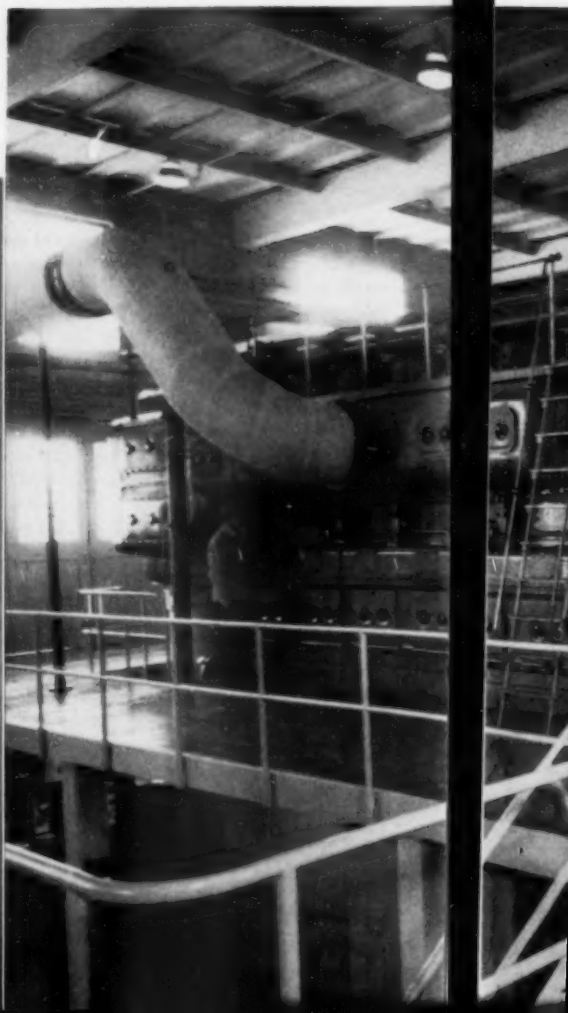
There is a gauge board near each engine with a multipoint exhaust pyrometer and gauges on jacket water, raw water, lube, gas, fuel oil, lube oil, starting air and scavenging air pressures and on jacket and lube temperatures. The alarm system includes an audible alarm and signal lights to identify the trouble. The boards also hold control switches for the water and oil pumps. The switchboard was designed by Ray G. Vollendorf, Superintendent of the Light and Water Department. Built to his specifications and utilizing parts of the old board, total cost for the big modern board was held to just $17,000. The board has seven feeder circuits, four generator panels with provision for a fifth, and a totalizing panel with recording kw. meter, voltmeter, pf. meter and ground detector. There is nothing over 110 volts on either side of the main board since all primary circuits are in a separate section of the rear of the board. All disconnects are in the open with easy access. A large room behind the board makes for easy maintenance and safety. All station power is transmitted in bus ducts with a separate breaker for each engine.

Beloit has expanded its use of electric power steadily from year to year with plant production rising from 3,245,100 kwh. in 1940 to 6,909,400 kwh. in 1950. Each year the alfalfa mill, creameries, grain elevators, hatcheries and other business consumers increase use of power. Each year, more residential consumers put in electric appliances and air conditioning. Today, the city has a plant capable of meeting these expanding needs for years to come, a plant that functions economically today and will increase in efficiency as the load grows. Power production has been profitable for this community and the performance of the dual-fuel units to date indicates clearly that future profits will be higher than ever.

List of Equipment

Engines—Two 6-cylinder, 18x27-in., 2,100-hp. Model 31AD18 dual-fuel units operating at 277 rpm. Fairbanks, Morse & Co.
Alternators—Two 1,875 kva., 1500 kw., 3-phase, 60-cycle, 2400/4160 volt alternators. Fairbanks, Morse & Co.
Governors—Woodward Governor Co.
Fuel unloading pump—Fairbanks, Morse & Co.
Fuel transfer pumps—Blackmer.
Fuel oil filters—Wm. W. Nugent & Co.
Fuel strainer—Trident.
Natural gas—Gas Service Co.
Gas meters—Metric Metal Works.
Individual gas meters—Veeder-Root.

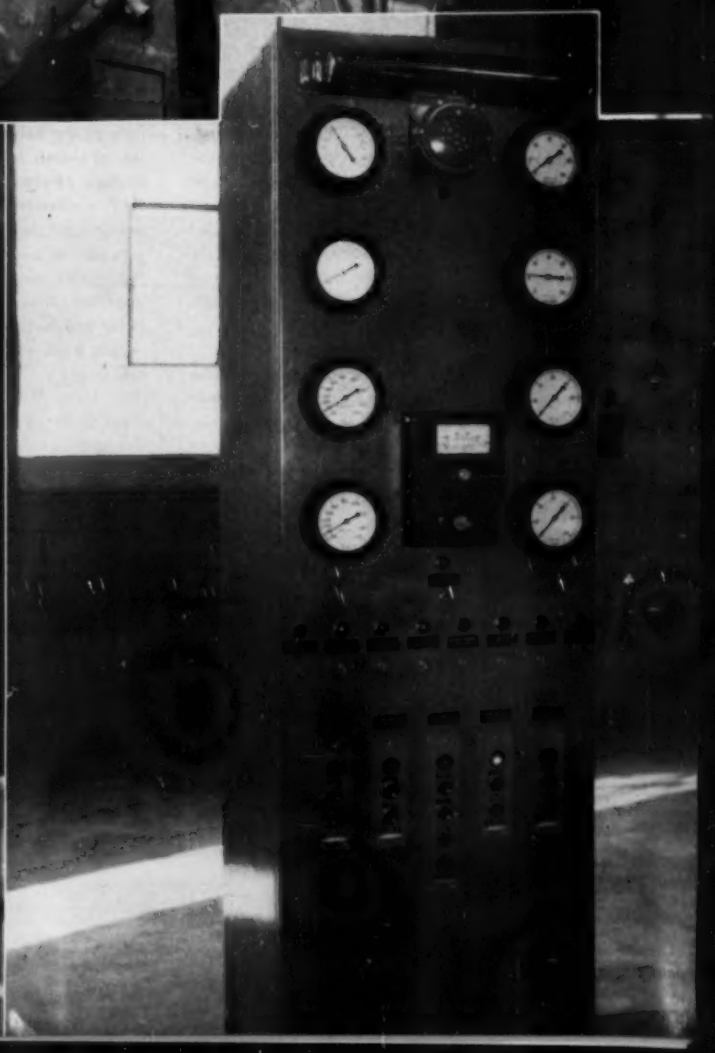
The spacious power plant has room for the two 2100-hp. F-M units, two 1080-hp. Alco engines and three additional prime movers to be installed as load development requires.

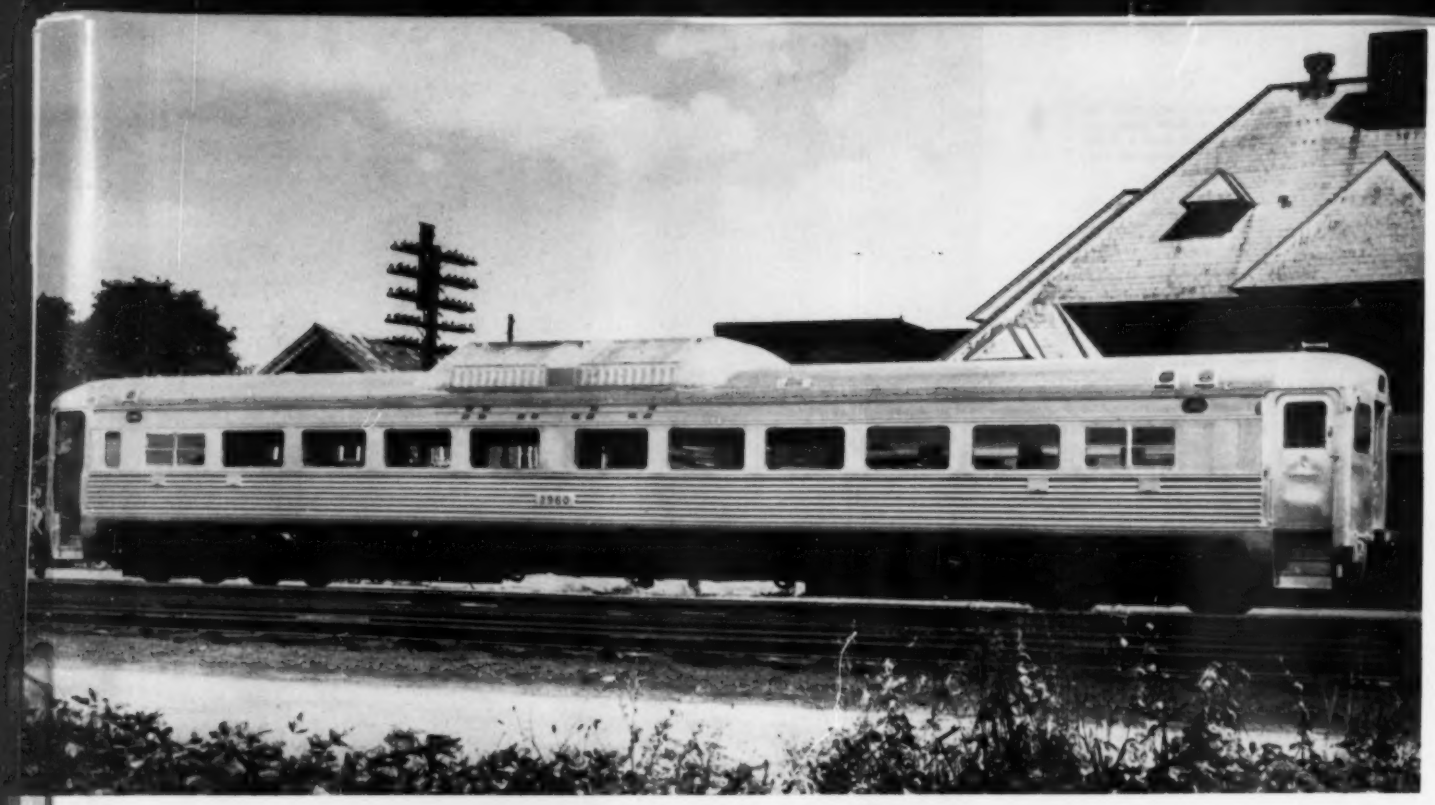


Each of the F-M engines is served by a Ross lube cooler, a Ross heat exchanger for jacket water and a Fairbanks-Morse centrifugal pump to circulate jacket water.

Pressure regulator—Fisher Governor Co.
Gas header alarm—Mercoid.
Lube oil—Standard Hd. Standard Oil Co.
Lube oil pump—Blackmer.
Lube oil reclaimer—Hilco. Hilliard Corp.
Lube oil cooler—Ross Heater & Mfg. Co.
Lube regulator valve—Powers Regulator Co.
Cylinder lubricators—Madison-Kipp.
Lube oil strainer—Air-Maze Corp.
Heat exchanger—Ross Heater & Mfg. Co.
Thermostatic valve—Powers Regulator Co.
Induced draft cooling tower—Fairbanks-Morse.
Air filters—Cycoil. American Air Filter Co.
Intake air silencers—Maxim Silencer Co.
Exhaust silencers—Maxim Silencer Co.
Gauge boards—Midwest Supply Co.
Pyrometers—Alnor. Illinois Testing Laboratories.
Gauges—Marshalltown Mfg. Co.
Alarms—Mercoid.
Starting air compressor—Ingersoll-Rand Co.
Diactor regulators—General Electric Co.
Station power bus ducts—Westinghouse.
Crane—3-ton Shaw.

Superintendent Ray G. Vollendorf inspects the big F-M dual-fuel units which are producing power at a total fuel cost of 3.71 mills per kwh.





THE BUDD RAIL DIESEL CAR

By SIDNEY HOFFMAN

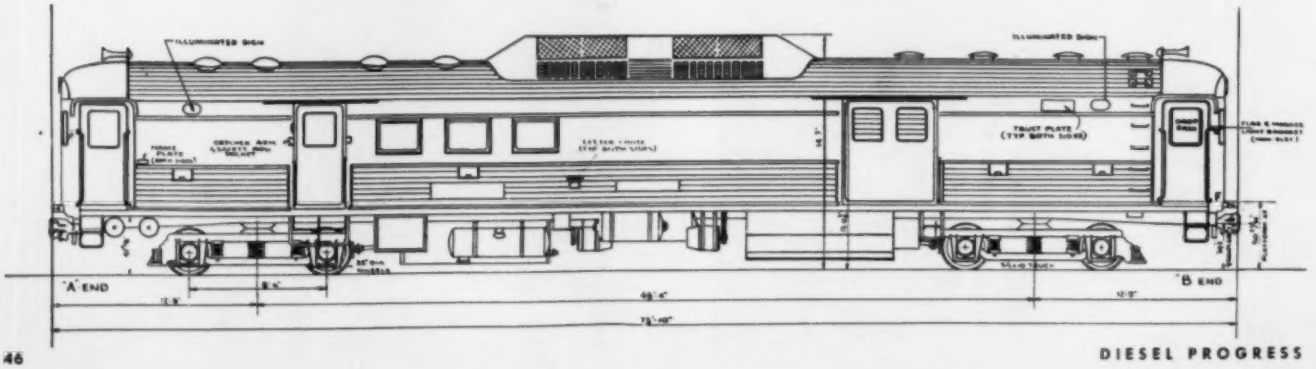
IF you have ever been near the right of way of the Western Pacific Railroad between Oakland, California and Salt Lake City, Utah, you may have caught a glimpse of one of Western Pacific's sleek Zephyrettes high-balling along on its "commuter" run of 924 miles. Two of these single, light-weight, stainless steel, self-propelled diesel cars maintain a tri-weekly schedule between those cities, averaging about 12,900 miles per month per car—154,000 miles per year!

Economy of operation and speeded up schedules are the major factors in the growing acceptance of the Budd RDC (for Rail Diesel Car). On one railroad, direct operating expense was only 44 cents per mile. The car's daily schedule was over 550 miles, a rate of 200,000 miles per year. This reduced the fixed costs to about 6 cents per mile for an overall figure of 50 cents. This amounted to about 14 cents less than the predicted cost. The RDC is a standard 85-ft. car. Its space-saving design has brought the seating capacity up to 90 passengers, leaving room for two cabs and two lavatories. The blister on the roof houses the engines' radiators, the exhaust ports and the air intakes. Exhaust noise and fumes are thus removed from the passenger level and clean air is provided for the engines.

Each car has two GM (Detroit Diesel) Model 6-110 two-cycle, six-cylinder engines with a rated horsepower of 275 each at 1800 rpm. They have a bore of 5-in. and a stroke of 5.6-in., operating at a compression ratio of 18:1. In this application, the Model 6-110 engine operates with the cylinder block inclined 70° from the vertical. Changes made in the standard model required a new oil sump and drains to allow oil to return to the sump from pockets created by inclining the engine. Located under the floor and working through GM torque converters they power the RDC from the flanged output shaft of the transmissions through a standard set-up of couplings, universal joints and splined telescoping shafts to the axle driving units.

The Torqmatic transmission consists primarily of a four element single stage GM torque converter with two sets of helical gears—forward and reverse

The RDC-4, for mail and baggage-express exclusively. It contains a baggage-express compartment of 31 ft. separated by a bulkhead and creep door from a mail compartment of 30 ft.



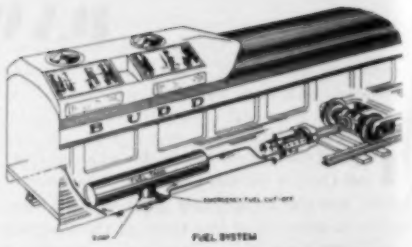
—mounted on the converter main shaft and driving through a countershaft which furnishes the output power to the railcar. The helical gears on the main shaft from the turbine output are engaged or disengaged to the power train, depending on which direction of travel is desired, by multiple disc clutches energized by oil pressure. Also the GM torque converter has a lock-up clutch built into the flywheel for the purpose of locking the transmission in direct mechanical drive at a pre-determined speed.

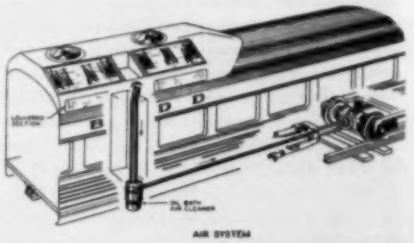
Each engine is enclosed in a sound deadening box with hinged drop covers for quick access to the engine control box and instruments. The box serves to protect the engine components from damage by flying ballast and keeps dirt, ice and snow from accumulating on the engine. This is a factor in increasing engine reliability. Repairs on the engine do not require pulling the car out of service. Using a special dolly, the engine can be removed within two hours and another engine installed. The unit requiring repairs goes to the shop and the car goes back into revenue producing service.

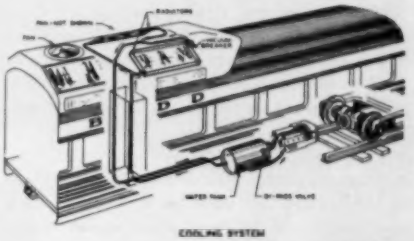
As mentioned earlier, the engine cooling radiators, the exhaust discharge and the air intake systems are located in the blister on the car's roof. Each engine has its own complete and separate system. The cooling system consists of a vented, well-lagged 75 gallon water storage tank and a by-pass valve located under the car floor, two radiators connected in parallel and two-speed, electrically driven fans mounted in the dome. The performance of the radiators and the fans in the roof structure is independent of the direction of car motion. The generous proportioning of the radiators minimizes the power requirement of the cooling fans. (For a detailed description of the cooling system, which utilizes "Amot" controls, see the April 1952 issue of DIESEL PROGRESS.) These independent systems for each engine are another factor in the RDC's ability to maintain service. In the event that one of the engines fails, the car can continue its run on the functioning engine.

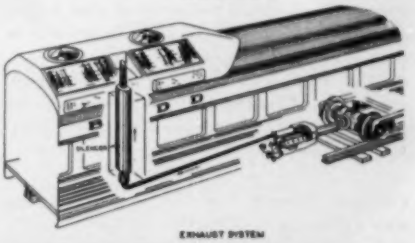
The dieselized railcar, used singly or coupled together to make up a train, answers a specialized need of railroads, namely, economical commuter service. The Budd RDC is a standardized unit built in four models. The RDC-1 is strictly for passenger carrying. The RDC-2 and RDC-3 combine passenger and baggage-express with the latter also having a rail post-office compartment. The RDC-4 carries baggage-express and mail only. All units have the same power plants and the same over-all dimensions except the RDC-4 which is somewhat shorter.

Among others, these cars have gone into service for the New York Central, The Chicago and Northwestern, The Lehigh Valley, Pennsylvania-Reading Seashore Line, Consolidated Railroad of Cuba, The Commonwealth Railways of Australia and the New Haven Railroad. Gratified by the performance records of the RDC's in its service, the New York Central recently added seven additional cars to its service. The use of these cars has had another effect on commuter service. The riding public likes them so much that, in several instances, although the new service has not been advertised, the number of passengers carried increased. Give the customer clean, modern and fast railroad service and he leaves his automobile in his garage!

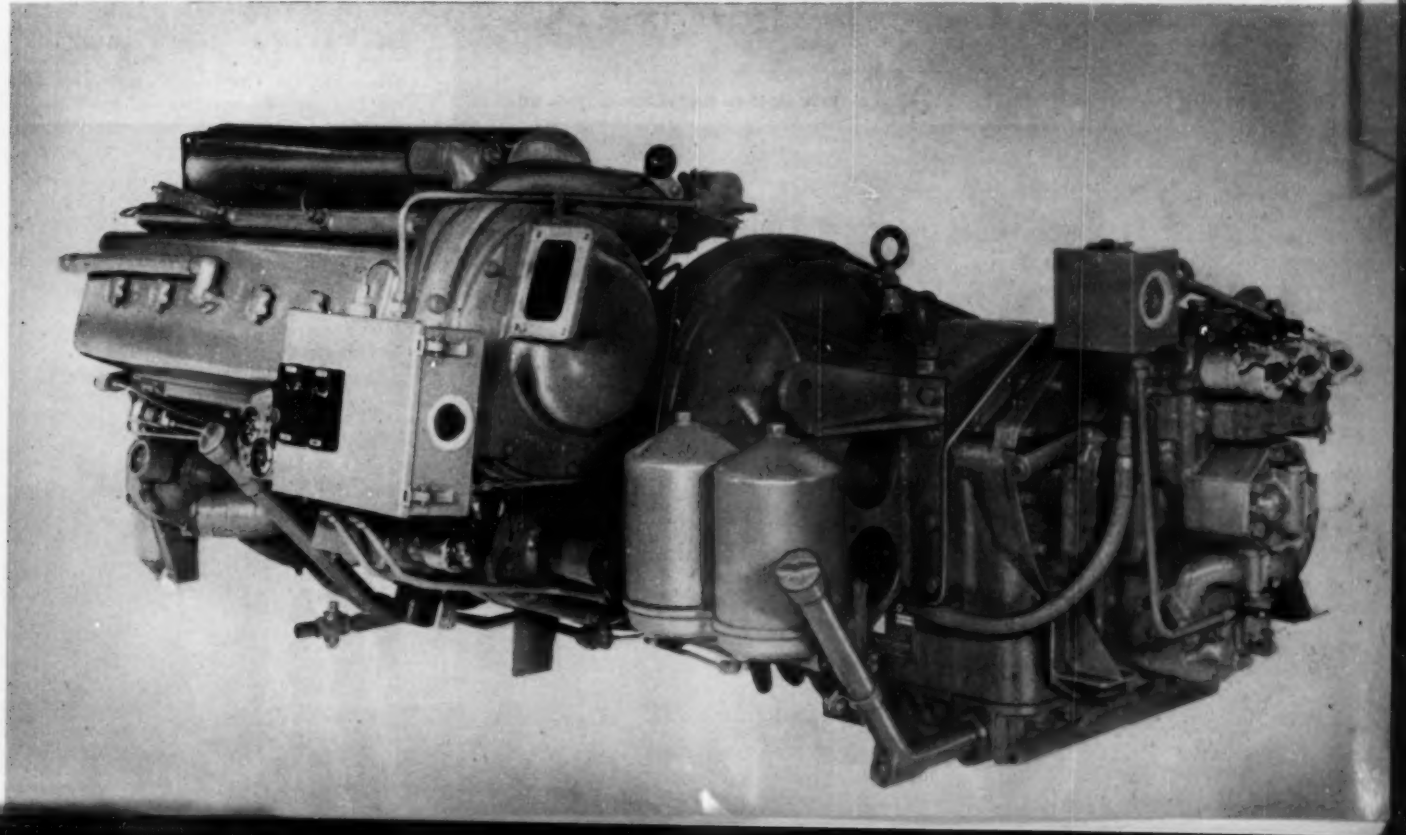








The GM (Detroit Diesel) Model 6-110 diesel inclined 70° from the vertical as applied in the Rail Diesel Car.



DAWSON CREEK, B. C.

By JAMES JOSEPH

THREE dates stand out in the minds of Dawson Creek's (British Columbia) 4500 citizens. There was the bleakly cold night in 1942 when the U. S. army rolled into town on the Northern Alberta Railway. Dawson Creek was the end of the line. Between Dawson Creek and the Alaskan border, some 1400 miles to the north, there was nothing but muskegs and mountains. The U. S. Army engineers soon pushed through the Alaska Highway, upped Dawson Creek's population to 15,000 almost overnight. The army also changed the town's status. Previously it had been sitting at the end of the line (the Northern Alberta Railway); now it stands at the beginning—of the Alaska Highway. When the original road was finished and the army pulled out, Dawson Creek settled down to a population of 4500. The second important date is 1951, when a couple of natural gas wells in the Pouce Coupé field, some 40 miles distant, came in, and supplied the town a few months later with natural gas.

But Dawson Creek's most memorable date (at least to some minds) was when the U. S. Army pulled out—and left its big diesel plant behind. Northland Utilities Ltd. had run the diesel plant for the army. After the war the plant was turned over to the Canadian War Assets commission and sold to the B.C. (British Columbia) Power Commission, although Northland continued to operate it under contract from B.C. Power until July, 1949, when B.C. took over.

Currently, there are four diesel engines installed, with a total output of 1680 kw., and a fifth engine is in the process of installation. When this fifth engine, a Cooper-Bessemer, is in, the plant will have a 2280 kw. output. The present installation includes two Cooper-Bessemers and two Fairbanks-Morses. The Cooper-Bessemers, converted with natural gas tips to dual-fuel operation, are the newer engines. The Fairbanks-Morse engines, being older models, will not be converted and will likely be replaced at a future date with dual fuel (natural gas-diesel) engines. The Cooper-Bessemers are rated 865 hp. at 450 rpm. and have six cylinders, and are 13-inch x 16-inch. One of these engines drives a General Electric (Canadian-built) type AT-1 alternator, rated 750 kva., 600 kw. (2400 volts, 180 amps.) at 450 rpm. The other Cooper-Bessemer unit drives an Elliott alternator, delivering 2300 volts, 3 phase, at 60 cycles and rated 750 kva. and 800 kw. The two Fairbanks-Morse diesels are Model 32, 360 hp. at 257 rpm. and are equipped with Woodward governors, type IC. Both drive Fairbanks-Morse alternators, type D, 300 kva., 257 rpm., 3 phase, 60 cycle and delivering 2400 volts. The fifth engine, just now being installed, is a Cooper-Bessemer, identical to the other two Cooper-Bessemers. It is replacing a Buckeye diesel, 9.5 inch x 14 inch. The new engine will drive a General Electric alternator rated 750 kva., 600 kw., 2400 volts at 180 amps and 450 rpm. This alternator will replace a G.E. ac. generator, rated at only 250 kva. Diesel fuel is still being used as the pilot fuel in both the Cooper-Bessemers, although they're being run mainly on natural gas.

Since the temperature at Dawson Creek has on occasion fallen to as low as 72 degrees below zero, radiator cooling is used instead of evaporative or open tank types. The radiators heat the plant and are vented so that they can take air either from outside the plant or inside, depending on outside temperatures. There's a Trane radiator for each engine, and they're equipped with 7½ hp. electric motors. With the present hook-up, outside air can be taken inside and then discharged outside. Or, inside plant air can be discharged inside or outside. Storage tanks for diesel fuel are inside the building and there are two tanks, one vertical, with a 12,491 gallons capacity, and the other, horizontal, with 8750 gals. capacity. In addition, each engine has a 600-gallon day tank. Most house tanks are gravity feed, but at least two are beneath the floor and feed via pumps. Even though tanks are installed inside the warm power plant, winter fuel is used as cold weather approaches. Fuel oil is trucked in to Dawson Creek from distances up to 400 miles, and costs up to 40 cents an Imperial gallon (an Imperial gallon is 20% larger than the U.S. gallon). This high cost is one reason that the nearby supply of natural gas has been a boon, and why the plant is converting to dual-fuel.

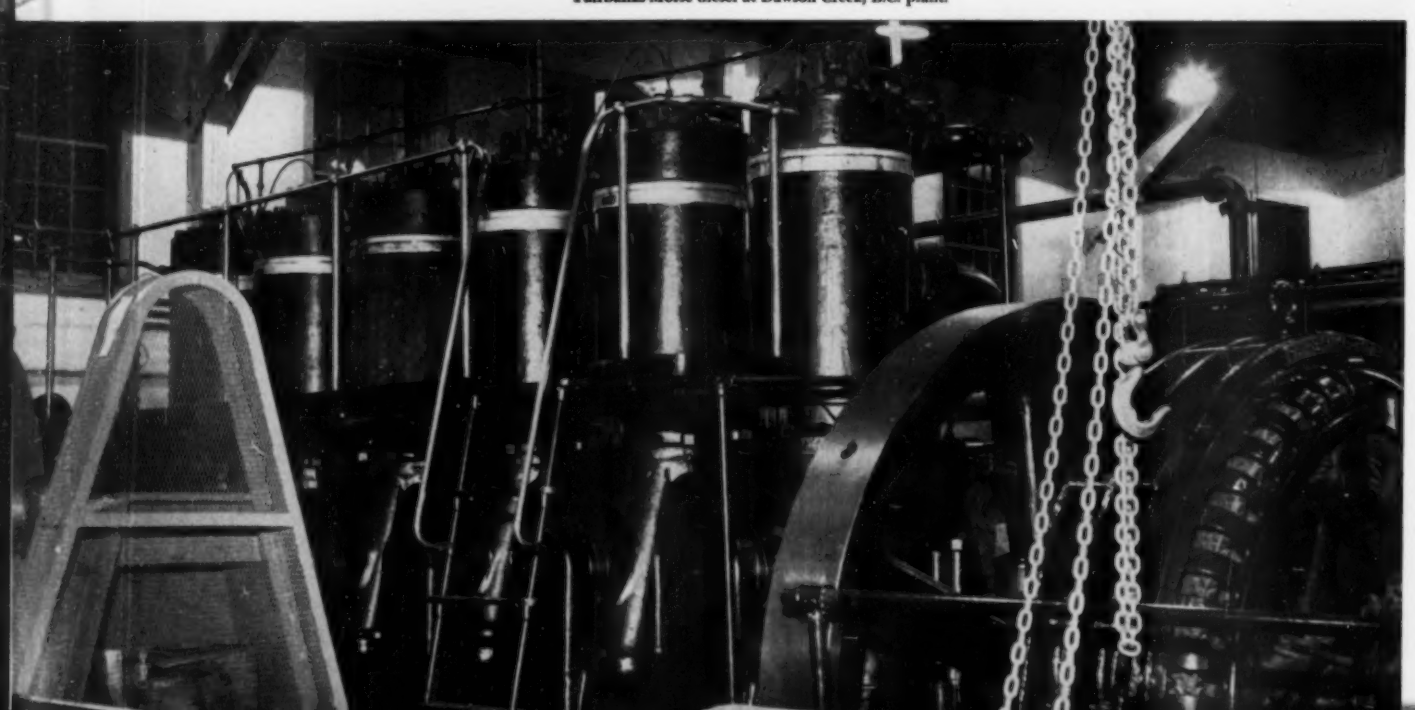
On a typical day, Jan. 29, 1952 (one of the coldest days this winter), the Dawson Creek plant operated three of its engines. On that day, #3 engine (Cooper-Bessemer) ran 24 hours; #2 engine (Fairbanks-Morse) ran 4 hours; and #5 engine (Cooper-Bessemer) operated 18.25 hours. Total operation for all engines: 46.25 hours. Here's how the lube oil and fuel oil use stacked up:

Engine:
- #3 used 4 Imperial gallons of lube oil.
- #2 used 2 Imperial gallons of lube oil.
- #5 used 7 Imperial gallons of lube oil.

Engine:
- #3 used 55 Imperial gallons of fuel oil.
- #2 used 60 Imperial gallons of fuel oil.
- #5 used 95 Imperial gallons of fuel oil.

Engines #3 and #5, operating dual-fuel, used a

Fairbanks-Morse diesel at Dawson Creek, B.C. plant.



total of 201 mcf. of natural gas and averaged 10.7 mcf. per kwh. Engine #2, operating straight diesel fuel, averaged 10.6 kw. per gallon of diesel fuel. Comparison between these two figures is pretty difficult unless we break them down into btu.'s, but it is noteworthy that on this day's operation, the two dual-fuel engines, using part diesel fuel and part natural gas, averaged as high as 176.3 kw. per gallon of diesel fuel. This figure was arrived at by considering the total gallonage of diesel fuel used compared to the hours of operation and kw. output. Since natural gas was the principal fuel, the kw. per gallon was naturally extremely high.

Number three engine has been used in the plant as a 24-hour unit. It is a Cooper-Bessemer and was delivered new in Oct., 1950. Here's an operational chart, showing its performance up to last July.

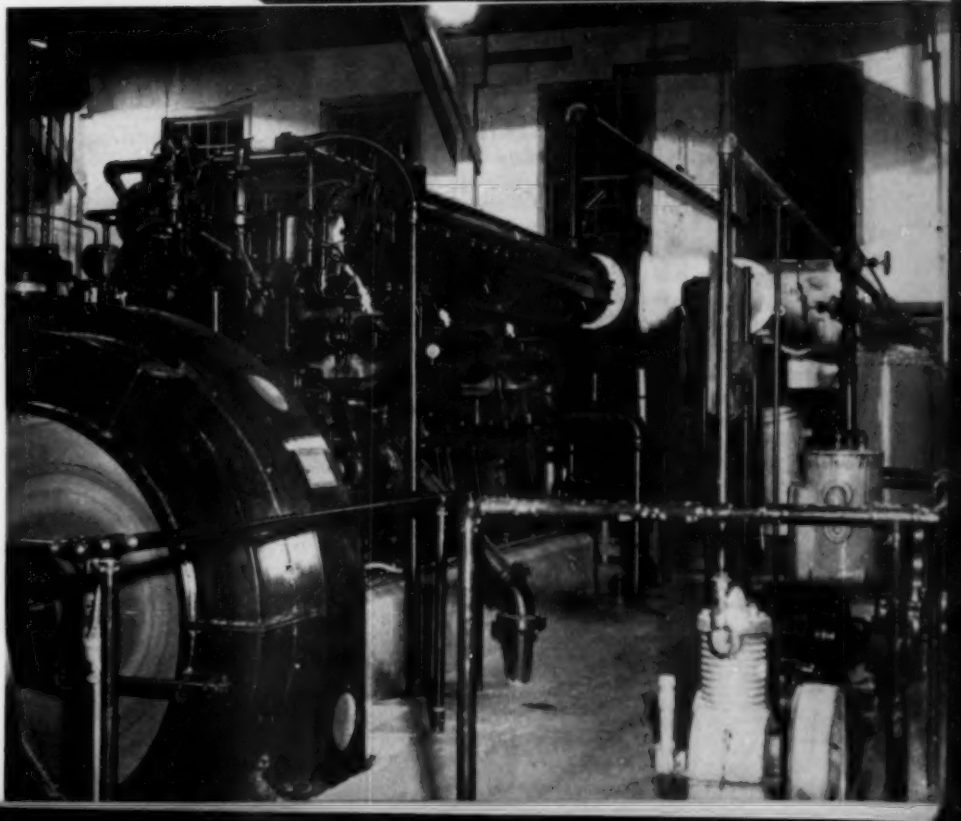
Month and Year	Monthly Hours Run	KWH. per gal.	Total Hours Run
Dec. '50	302	123.4	302
Jan. '51	713	98.8	1015
Feb. '51	611	185.7	1626
March '51	595	214.0	2221
April '51	659	181.0	2880
May '51	701	195.0	3581
June '51	664	149.2	4245
July '51	655	168.5	4900

To evaluate this consumption chart, we should also know what repair work was done on engine #3: Dec. 20 '50: Hours run, 40; work done, valve tappets adjust; materials and man hours, 1. Feb. 23 '51: Hours run: 1554; work done, gas tips installed in nozzles; materials and man hours, 4. (Through Dec. '50 to July '51, a total of 64 material and man hours of maintenance were put into engine #3.) Samples of this engine's lube oil are sent to Faber Laboratories periodically for checking and evaluation.

Chief operator at Dawson Creek is Harold Bennett. Cecil Hartnell is an operator, and Fred Stansfield is District Manager. Stansfield has a long background with diesel equipment. He learned diesel and steam engineering with the Royal (British) Navy, and came to Canada in 1927. He started with the construction division of the Dominion Electric Power Ltd. in Saskatchewan in 1928, and later was Assistant superintendent with Northland Utilities, Ltd. until he joined B.C. Power in 1949 when the Dawson Creek plant was acquired by B.C.

It might be interesting to note that Dawson Creek's first diesel plant, a small affair totalling about 90 hp. was originally owned by Dominion Electric Power Ltd. The plant, first established in 1937, had three diesels: a 45 hp. A.P. Everest; a 25 hp. Marshall and a Lister, 20 hp. Northland Utilities Ltd. bought out Dominion when the Social Credit party of Saskatchewan took over that company, and liquidated its properties outside of the Province of Saskatchewan. British Columbia Power Commission, incidentally, recently announced an output of 267,488,496 kwh.—a new high—for its various facilities, many of them diesel, in British Columbia. This figure represents an increase of nearly 100,000,000 kwh. over pre-war years. Average monthly consumption for the Province's towns using B.C. Power facilities is up for both residential and commercial customers. The average monthly consumption for residential users increased from 110 kwh. to 126 kwh. in 1951; commercial customers are using more power too, having increased from an average monthly consumption of 420 kwh. to 460 kwh. Meanwhile, as Dawson Creek becomes more important, not only as a terminus of the Alaskan Highway, but as a rich wheat area and as a potential petroleum and natural gas producer, its power plant will likely expand still further. And future units, like new ones being installed, will be dual-fueled.

Operator Cecil Hartnell checks readings for hourly reports at Dawson Creek, B.C. power plant.



Cooper-Bessemer diesel at Dawson Creek, B.C. It's dual-fueled, natural gas and diesel fuel.

PACKARD MARINE DIESELS

By WILBUR W. YOUNG

AGAIN, Packard enters the marine engine field —this time with an interesting group of diesel engines which are described here in detail. Packard has long been known as a builder of fine engines for automotive uses. Its name has also been associated with diesels from time to time down through the years. While never a persistent contender in the marine engine field, Packard, nevertheless, achieved an enviable reputation during the last War. It was for this all-out effort that the Company developed and produced the now famous line of Packard 4M-2500 marine engines that did yeoman service in World War II. Over twelve thousand of these engines were delivered to a long list of boat builders for installation in fast Navy craft including the hot PT boats, Motor Torpedo boats, Air Sea Rescue and Motor Gunboats. A great line of engines that set the pace for the rising tempo of modern marine warfare.

And now Packard moves into the defense program with a closely integrated family of high speed, light weight, exceptionally compact, high specific output, four-cycle diesels, at present being produced for the U. S. Navy. Embodying many unique features and at the same time reflecting basically sound design elements drawn from the Company's vast experience, these engines bring a number of advances to the art. Known as the Packard Series 142 engines, there are two basic models, a 6-cylinder in line, and a 60 degree V-twelve, both 5 3/8-in. bore, 6 1/4-in. stroke, having turbo supercharged ratings of 300 bhp. and 600 bhp., respectively, for continuous service at 2000 rpm.

The extensive use of aluminum for all structural members and alloys for working parts result in a very low weight to output ratio. The six cylinder engine has a shipping weight of 2200 lbs.; the twelve, 3250 lbs., giving the six a specific weight of 7.34 lbs./bhp. and the twelve 5.41 lbs./bhp. The complete family of engines now in production is given below:

1D1700—Basic V-twelve, 600 bhp.* @ 2000 rpm.
- T-1—Propulsion, R.H. with reduction gear.
- T-2—Propulsion, L.H. with reduction gear.
- T-3—Generating Unit.
- T-4—Propulsion without reduction gear.
- T-5—Generating Unit.
- T-6—Generating Unit.

2D850—Basic Six-Cylinder, 300 bhp.* @ 2000 rpm.
- R-1—Propulsion, R.H. with reduction gear.
- R-2—Propulsion, L.H. with reduction gear.
- R-3—Generating Unit.

Interchangeability of parts is one of many distinguishing features of these engines. The adoption of a basic standardized cylinder assembly for all models renders practically all working parts interchangeable. Even the crankshaft is the same for both six and twelve cylinder engines. The crankshaft has 4-in. main bearing journals and 3-in. connecting rod journals. Other parts common to all models of both engines are the integral cylinder head and wet liner assembly, pistons, piston rings, wrist pins, intake and exhaust valves, valve springs and guides, main and camshaft bearings, camshaft carrier castings, fuel injectors and multiple plunger fuel pumps, also many minor parts.

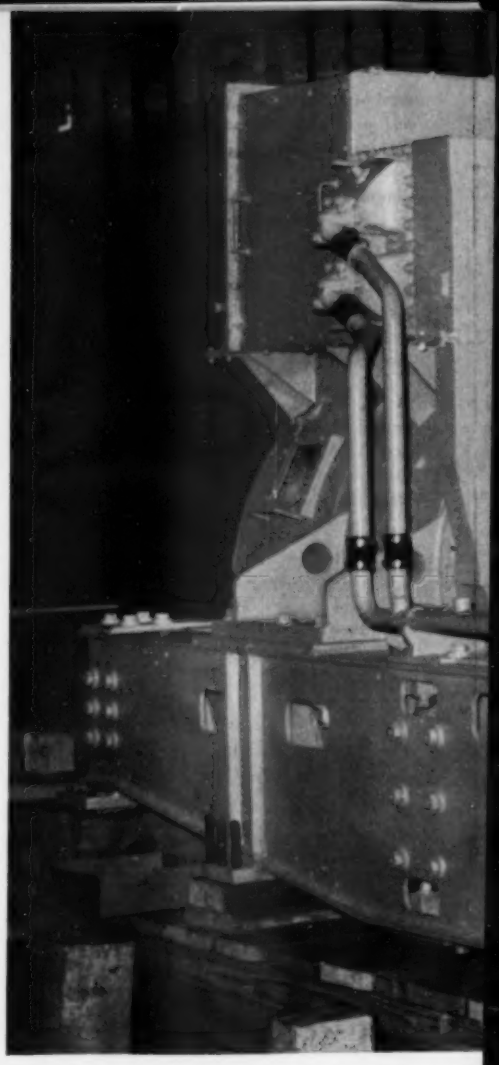
Turbo supercharged ratings.

The cylinder barrel or liner is nitrided steel and the precision cast alloy steel head is welded to the liner forming an integral assembly which is secured in the block by an internal steel copper plated ring nut. The cylinder head carries the four valves, two intake and two exhaust, the valve springs and guides, the fuel injector, the precombustion chamber and burner. This burner is a unique feature. It is a multi-orifice unit, threaded into the cylinder head, directly above the center of the piston. Its function is to distribute and direct the combustion blast onto the dome of the piston. The burner, being located in a non-cooled zone, serves also to preheat the intake air as it is forced from the main combustion chamber into the precombustion chamber on the compression stroke. This aids in vaporization of the fuel and initial ignition. The combustion system employs a spherical precombustion chamber, about three quarters of which is precast in the center of the cylinder head. The upper portion of the precombustion chamber is formed in the lower end of the fuel injector holder. A pintle type fuel injector mounted in the center of the cylinder head injects fuel into the precombustion chamber where ignition begins and peak pressures are developed. The burning mixture is ejected through the orifies in the burner in the main combustion chamber and the cone on the piston dome disperses the high velocity jets radially in an outward and upward swirl causing high turbulence which thoroughly mixes the fuel and compressed air. The effect of this system is to promote complete, clean burning of the fuel and a prolonged, soft power cycle.

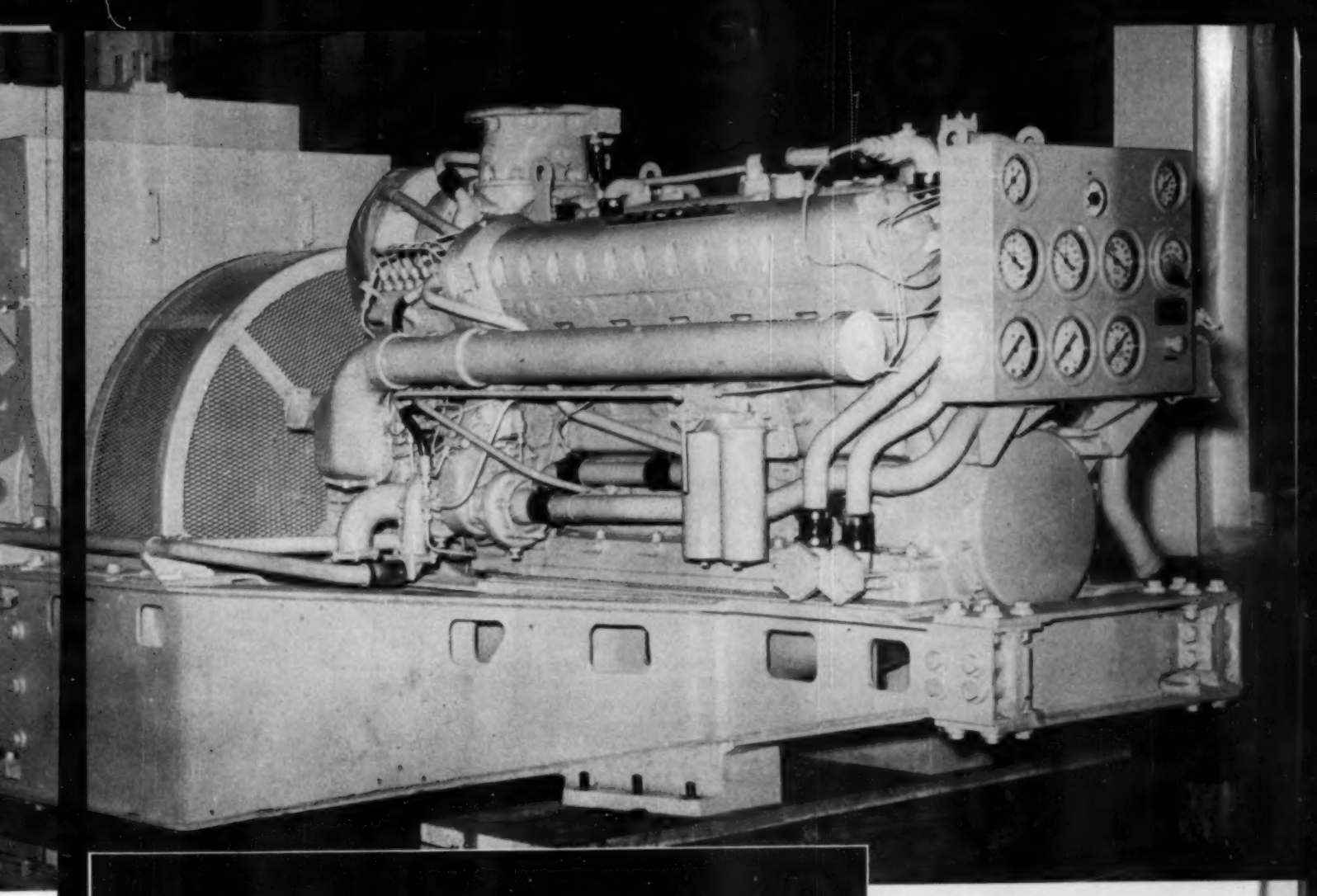
Because the peak pressures in the main combustion chamber are considerably lower than those in the precombustion chamber, which is relatively small in area, this combustion system permits lighter weight construction of the head and cylinder.

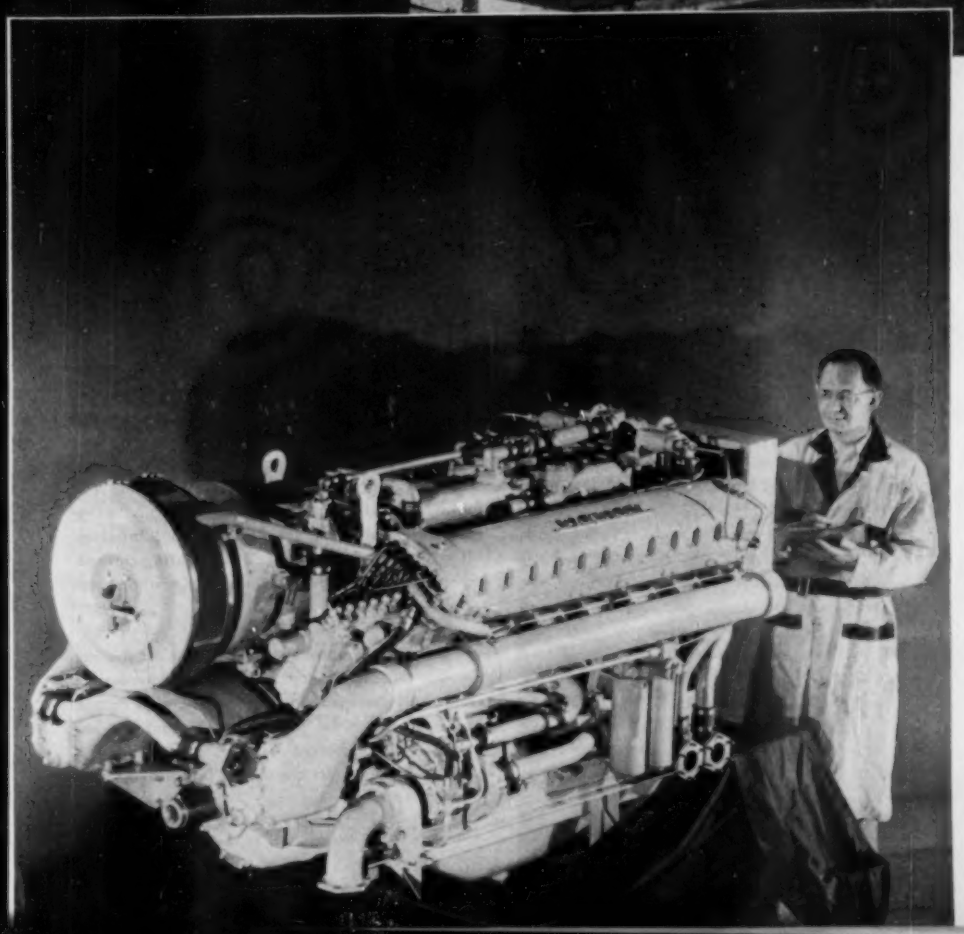
A six-plunger fuel injection pump serves both basic engines, one pump unit for the six-cylinder engine and two pump units for the V-twelve. The lengths of all fuel lines are equal. The fuel injection pumps incorporate a special feature worked out between Packard and the pump manufacturer. These pumps are of the constant-stroke, cam-actuated, lapped plunger type. The plungers are right hand double helix type with a starting land. The double helix plunger gives a variable beginning of injection also a variable ending of delivery. For best starting, a relatively large amount of fuel at a relatively retarded timing is required. The desired combination is not obtainable at any position of the plunger helices, and the starting land is incorporated to provide the retarded start of injection needed for quick starting. An ether priming system is provided to permit introduction of ether into the air induction system to assist in starting under adverse conditions of low temparature. The priming fluid under high pressure is contained in sealed capsules which are punctured by a manually operated discharger to prime the engine. Engine speed is regulated by a hydraulic governor controlling fuel supply. An overspeed trip governor is also installed for additional safety. This operates a conical, spring loaded valve which cuts off the intake air, immediately stopping the engine in the event of overspeed.

As mentioned above, these Packard diesels have very low specific weights. Contributing to this



The Packard V-twelve diesel generating unit being prepared for shipment.





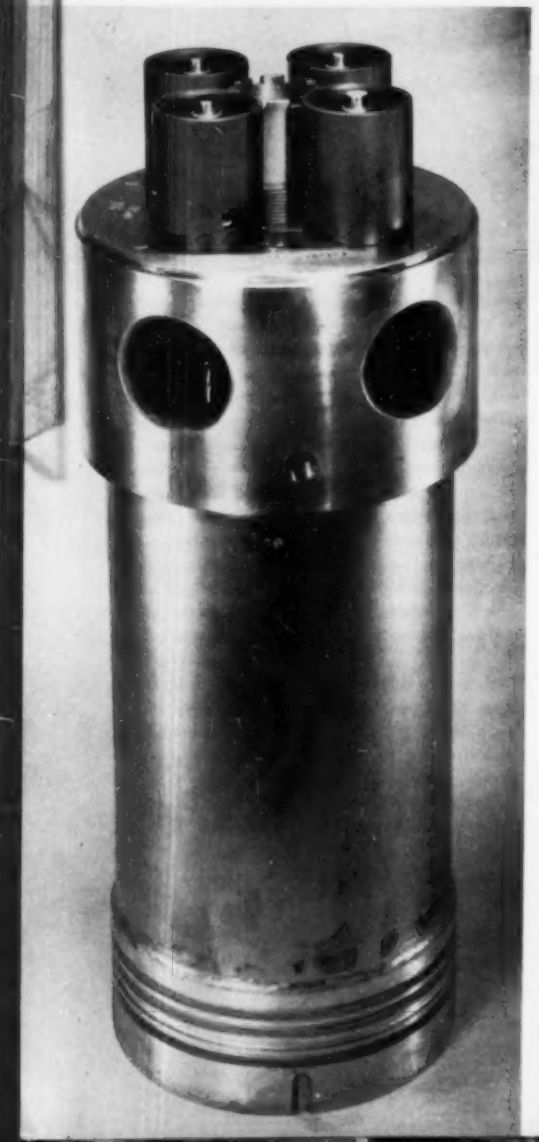
low ratio of weight to output is the maximum use of aluminum. The integral cylinder block and crankcase is a complicated and massive aluminum casting. It is an exceptionally rigid structure with solid bulkheads placed at the main bearing locations for rigidity. To provide further stiffening in this structure, the main bearing caps are secured by long through-bolts, which pass through the caps to bosses on the outside of the crankcase. The gear train housing is another intricate casting of aluminum which becomes a sub-assembly carrying the timing gears and ball bearings. All manifolds are aluminum castings, as are the valve covers, camshaft carrier plates, turbo supercharger housing and various other parts.

Pistons are substantially proportioned and are made of permanent mold aluminum alloy with a machine-formed inverted mushroom dome cavity. Five rings are fitted on the piston, the top compression ring being chrome plated, the next two being tapered face compression rings, immediately below which is a double oil wiper ring with another oil control ring near the bottom of the skirt.

12-cylinder Packard Marine Diesel ready for shipment.

Since firing pressures are confined within the individual and integral cylinders and cylinder heads, the top cover plate has only to carry the camshafts. It is a relatively light aluminum casting in which the camshaft bearings are fitted and which is secured to the block by studs without need for gaskets. There are two camshafts, one to actuate the intake valves, the other for exhaust valve operation. The cams act directly on spring loaded followers. There are no rocker arms, pushers or valve adjusters as such. Exhaust valves are sodium cooled, intake valves are solid stem. All valve faces are Stellite as are the valve seats. The valve springs are of nested, damping type. Valves are caged in a cylindrical barrel which is an integral part of the valve guide. A barrel-type tappet, fitted over the springs, slides with the valve guide barrel. Fitted over the valve stem tip and contacting the inner face of the tappet is a button which provides all of the valve clearance adjustment necessary.

Cylinder liners are nitrided steel and the complete cylinder assembly shown here consists of liner, jacket and cylinder head. The latter carries complete valve mechanisms for two inlet and two exhaust valves, the fuel injector holder, precombustion chamber and burner. The head is a precision steel casting and is welded to the cylinder.



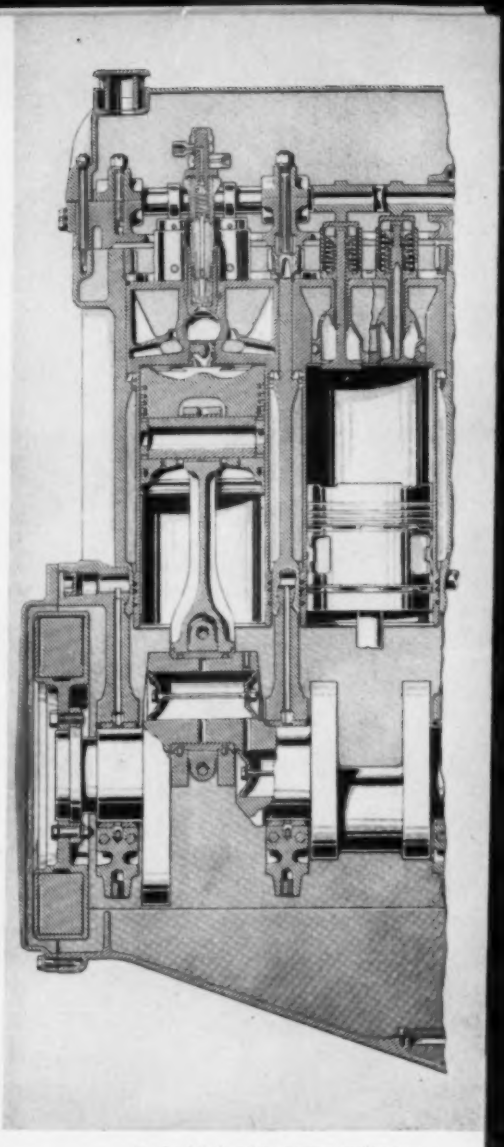
The crankshaft is an alloy steel drop forging with seven main bearing journals, counterweighted and perfectly balanced and nitrided to insure long wearing qualities. It is fitted with a viscous fluid vibration damper. The main and rod journals are hollow bored to reduce weight. The crankshaft is standard and interchangeable for all engines in the group being described here.

Connecting rods are of drop forged I-section steel. Rods for the V-twelve engine are fork and blade type.

Main bearings are interchangeable, precision type, steel backed silver with lead tin overlay to prevent scuffing. Connecting rod bearings are of the split shell precision type and are replaceable without boring. The shells have flanged ends and are clamped in the rod and held in position by dowel pins in the connecting rod caps. The shells are steel-backed, lined with silver and lead-tin plated on the crankshaft journal bearing surface. A band of bearing silver around the outer surface of the steel back on the shell provides a bearing surface for the blade rod which rides inside of the yoke of the fork rod. Connecting rod bearings are split shell, precision replaceable type.

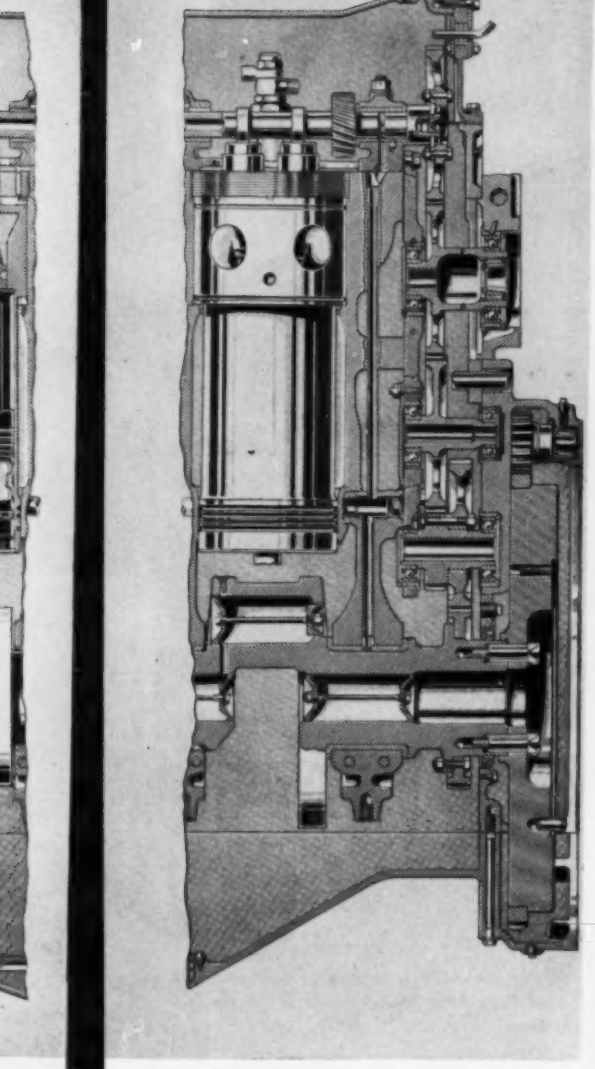
Air intake is at the drive end of the engine, with a compact turbo supercharger and air filter-silencer. Handling of exhaust gases to the turbo supercharger is managed in an interesting way. The cylinders are exhaust manifolded in groups of three to serve the four exhaust gas inlets to the supercharger turbine. All manifolds and manifold extensions are of cast aluminum water jacketed and cooled by fresh water to minimize heat radiation to the engine space. At the same time it is desirable to prevent heat losses and attendant energy losses from the exhaust gases to the coolant. Therefore, the inlet passages to the upper manifolds and the manifold extensions are lined with stainless steel sleeves with asbestos insulation cemented to the outside of the sleeve. The exhaust gases from the exhaust manifolds are discharged into the supercharger turbine through a water jacketed cast aluminum coupling. The coupling exhaust passages are lined with insulated stainless steel sleeves. Intake air is aftercooled through a compact heat exchanger placed between the turbo supercharger and the intake manifold. Two of these aftercoolers are used on the V-twelves, one for each bank of cylinders.

The lubrication system embodies and combines the simplicity and effectiveness evolved through Packard's long experience. The engine is pressure lubricated using the dry sump principle. Oil supply is carried in a remotely located supply tank from whence it is drawn by the pressure oil pump and is strained before being circulated through the engine. A pressure relief valve between the pressure pump and the engine controls oil pressure. Drain back oil is withdrawn from the oil sump in the crankcase lower half and is filtered and circulated through a heat exchanger before being returned to the supply tank. Oil at regulated pressure is piped to the inlet connection on the crankcase and then flows transversely through a cored and tubed passage to the main oil distribution manifold, which is a cored and tubed passage running the full length of the crankcase. From this manifold, passages in the crankcase upper half transverse webs carry the pressure oil to the main bearings. From the main bearings, oil passes through drilled passages in the crankshaft cheeks to the connecting rod bearings. Oil thrown off the main and connecting rod bearings onto the cylinder walls lubricates pistons and rings. Oil thrown off the camshaft bearings that falls inside the cylinder retainer lubricates the valves and valve tappets. Pressure oil for supercharger lubrication is taken from the engine oil inlet fitting through a tube to the oil inlet on the side of the supercharger housing.



In the left hand transverse section are seen, starting at top, the camshaft, the fuel injector, the spherical precombustion chamber with the burner connecting to the main combustion chamber,

Basically the engines are arranged for air starting motors but electric starting is used on some sixes and can be adapted to all engines. Quick, certain cold starting is the prime requisite and this has been carefully worked out, not only in the optional starting units themselves but also in other



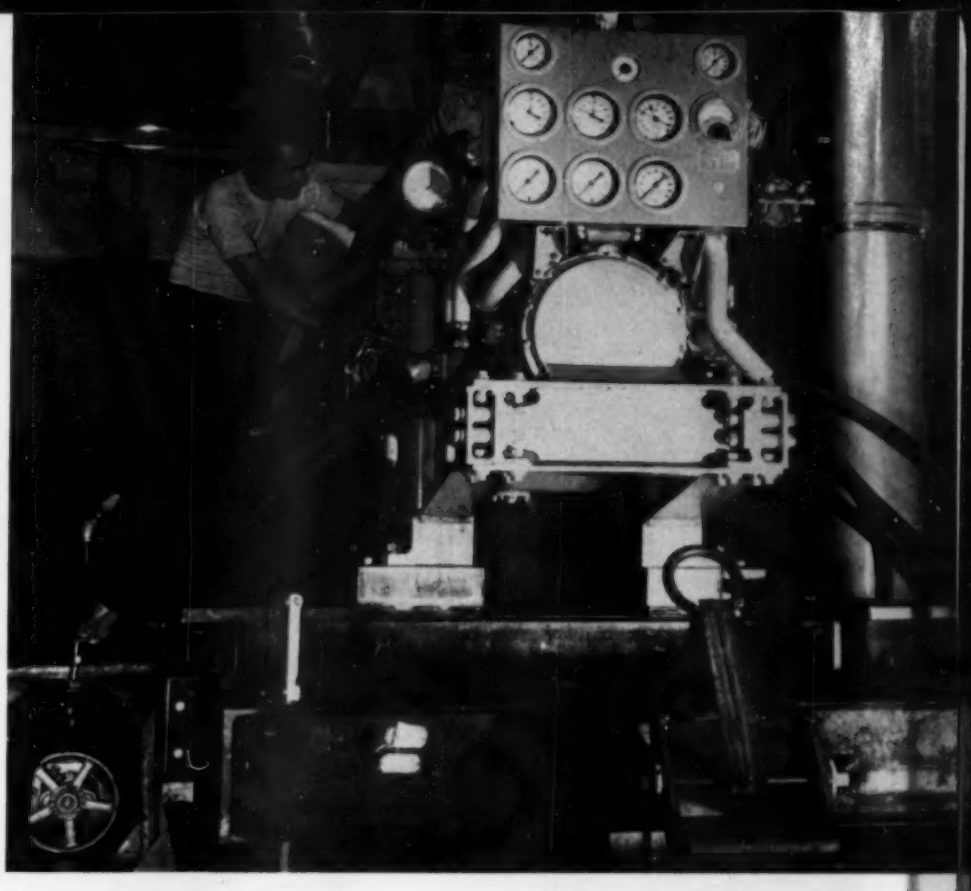
then the piston, and lower left, the viscous fluid vibration damper. The right hand section shows the complete cylinder and cylinder head assembly, also the timing gear train.

features of the combustion system discussed above.

The reader has observed a number of references to the low specific weight of this new line of Packard marine diesels. It is a feature that insists on coming to the fore as we study them. And it is a feature that is destined to influence the ultimate future uses of these engines. The following table carries some significant comparisons, the data for which were taken from the 1952 Statistical Issue of *Automotive Industries*:

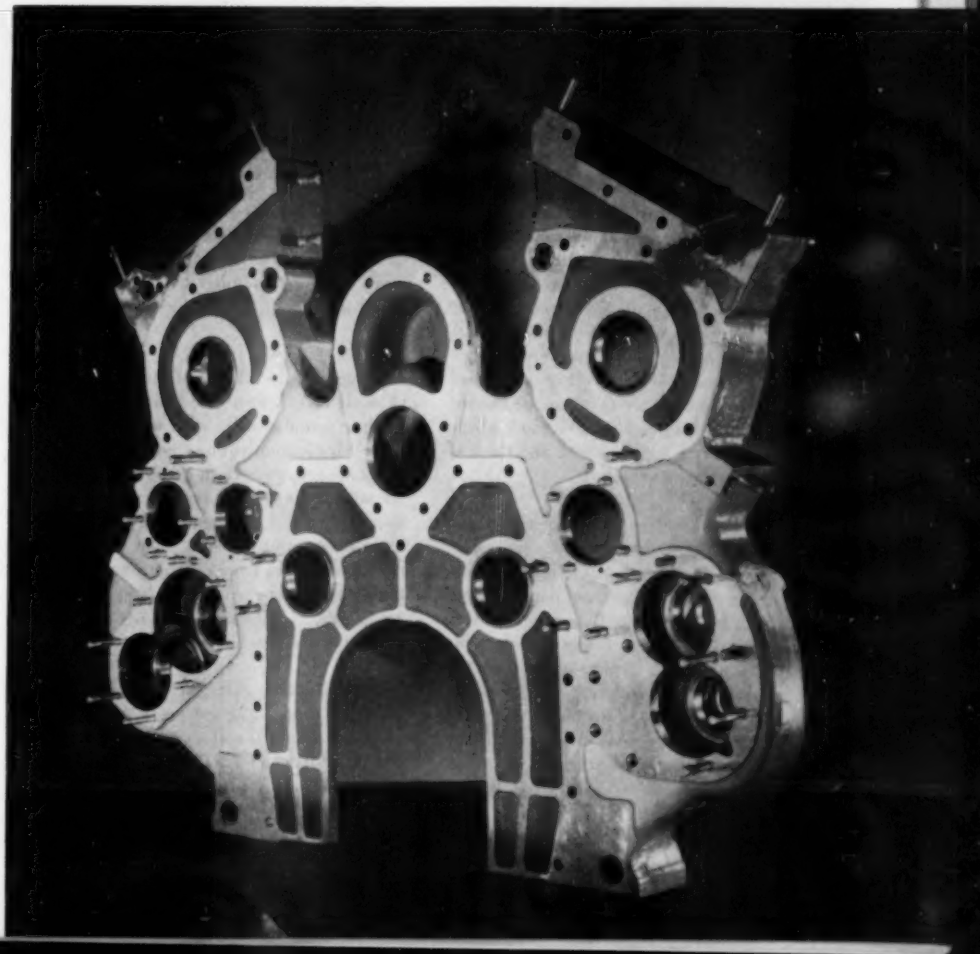
Make	BHP. Cont. Rating	No. Cyls.	Shipping Weight (lbs.)	Lbs./ bhp.
Packard	300	6	2,200	7.34
Packard	600	V-12	3,250	5.41
Engine A	520	24	12,600	24.23
Engine B	348	6	13,000	37.35
Engine C	374	V-12	14,000	37.43
Engine D	345	V-8	4,800*	13.62
Engine E	350	V-12	5,700	16.28
Engine F	335	6	12,000	35.82
Engine G	185	6	4,600	24.86
Engine H	152	6	4,310	28.35

*Industrial.

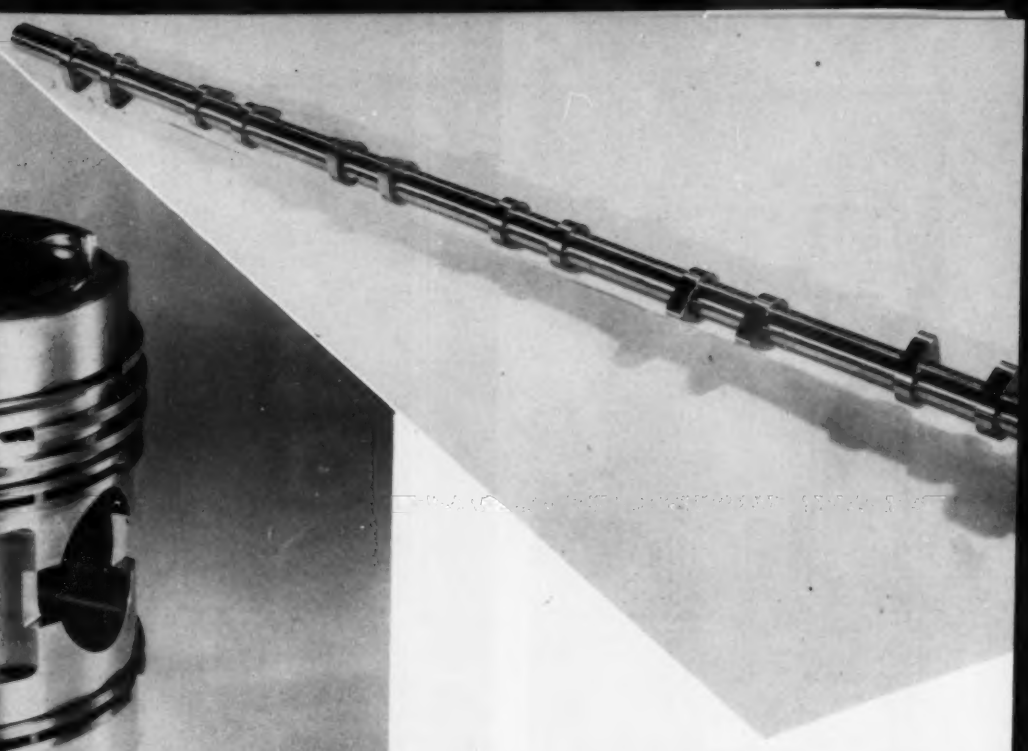


A view from the control board end of the V-12 engine in the test cell at Packard.

This intricate aluminum casting houses the timing gear train.



Pistons are permanent mold aluminum alloy castings with machine formed domes. They are fitted with three compression rings, the top ring being chromium plated, and two oil rings.



Overhead camshafts are interchangeable for all models of sixes and V-twelves. They are one-piece steel forgings and the cams operate directly on the valve tappets.

The Panish clutch and throttle controls for Packard diesels with hydraulic reverse gears and the Panish start-run-stop controls are 100% mechanical in construction and used on Navy applications of the Packard line of diesel engines. These devices are noteworthy for positive and foolproof action, simplicity and exclusive features protecting the entire propulsion plant against damages from careless or excited maneuvering. The clutch and throttle control is a two lever unit which may be located in the pilot house, on the open bridge or any other remote control point. Connections to the engines are entirely through mechanical push-pull cables. The "neutral" position is common for both levers. A unique feature of these controls is the mechanical interlock which forces the operator to execute clutch and throttle maneuvers in the correct sequences.

For example, the throttles may be opened to any degree from "idle" position to full open for warming up, injector, governor-speed and droop adjustments, etc., but the clutch lever can not be moved while the throttle lever is out of idling (maneuvering speed) position. This precludes engaging the clutches while the engine is operating at excessive speeds, preventing shock loads and damage to the reverse gear and propulsion assemblies. Likewise, it is impossible to disengage the clutches while the throttles are open to any degree, thereby protecting the engines proper against run-away speeds and resulting damages. Moreover, the clutch lever must be in full ahead or full astern position before the throttle lever can be advanced from idling position, protecting the reverse gears against partial engagements. The interlocking mechanism is so simple and yet so positive that the roughest handling can not circumvent the proper sequence of operations nor damage the mechanism. Fine throttle adjustments can be made in unlimited increments and throttle settings are automatically maintained in all positions without clamping or creeping.

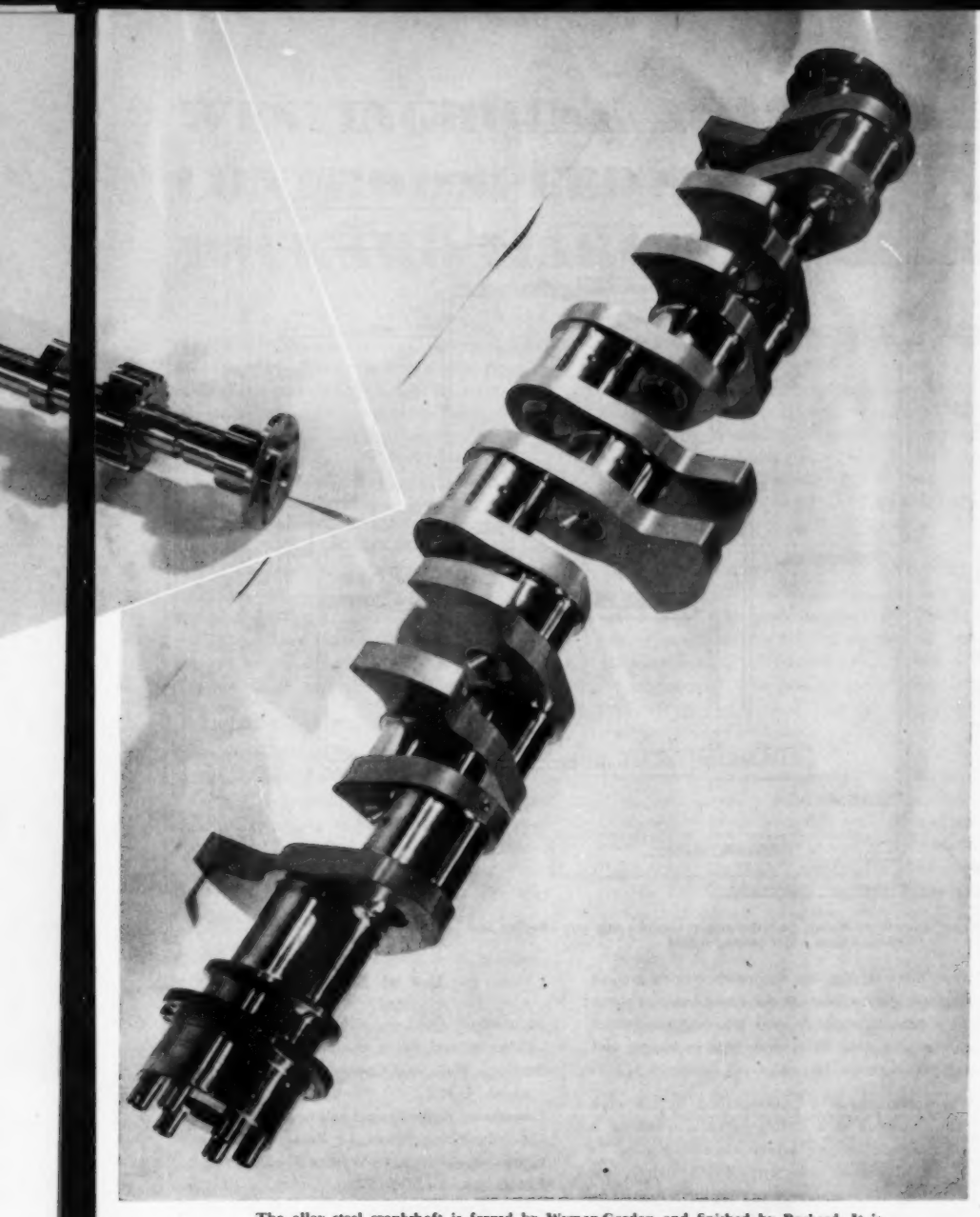
The single engine clutch and throttle control may be mounted on either side of the steering wheel. Twin or multiple engine units may be grouped for single hand operation of all engines. Cable movements are reversible which simplifies connection of the cables at engine end for either push or pull to operate the clutch lever for ahead or astern. Flexibility of the cables is such as to permit passing them around obstructions, through watertight bulkheads like running a wire, but they give positive mechanical transmission of the desired clutch or throttle movements.

In the description of the fuel injection pumps for the Packard diesels, it was pointed out that these pumps incorporate a special starting feature. In this connection, the Panish start and stop control has certain collateral features. Like the clutch and throttle control, it is also 100% mechanical and it provides three distinct positions for the fuel racks.

First, the start position is interlocked with the engine starting solenoid push button so that the engine cannot be started unless the fuel racks are properly located in the starting position. Then the running position is provided with adjustment for definitely locating the fuel racks within the governor range. Finally, the stop position locates the fuel pump plungers in the no-fuel position.

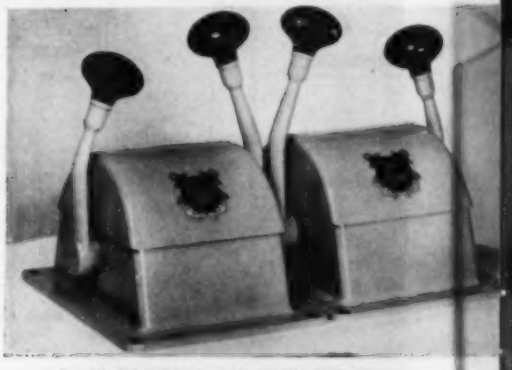
These controls were developed by Panish Controls in liaison with Packard to provide a simple, 100% foolproof mechanism which meets all Navy requirements and, at the same time, conforms with the characteristics of these engines.

A balanced by-pass type closed fresh water cooling system protects the engine jackets and heat exchangers against scaling and corrosion. Cooling of the fresh water is effected by a sea water heat exchanger. The turbo supercharger is water jacketed and is included in the engine cooling system also the lube oil cooler. Jacket water enters at the bottom of the cylinder blocks and flows upward with a swirling motion, entering the cylinder head from the top of the jacket through a ring of holes around the outside of the head and thence through cored passages across the top of the head



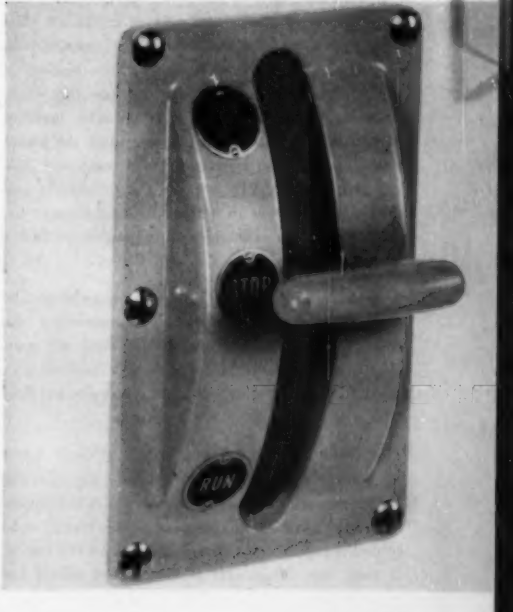
The alloy steel crankshaft is forged by Wyman-Gordon and finished by Packard. It is nitrided for long wearing qualities and hollow bored to reduce weight. The bores are plugged to provide oil pockets.

Panish POSITROL with mechanical clutch and throttle interlocks—single engine unit.



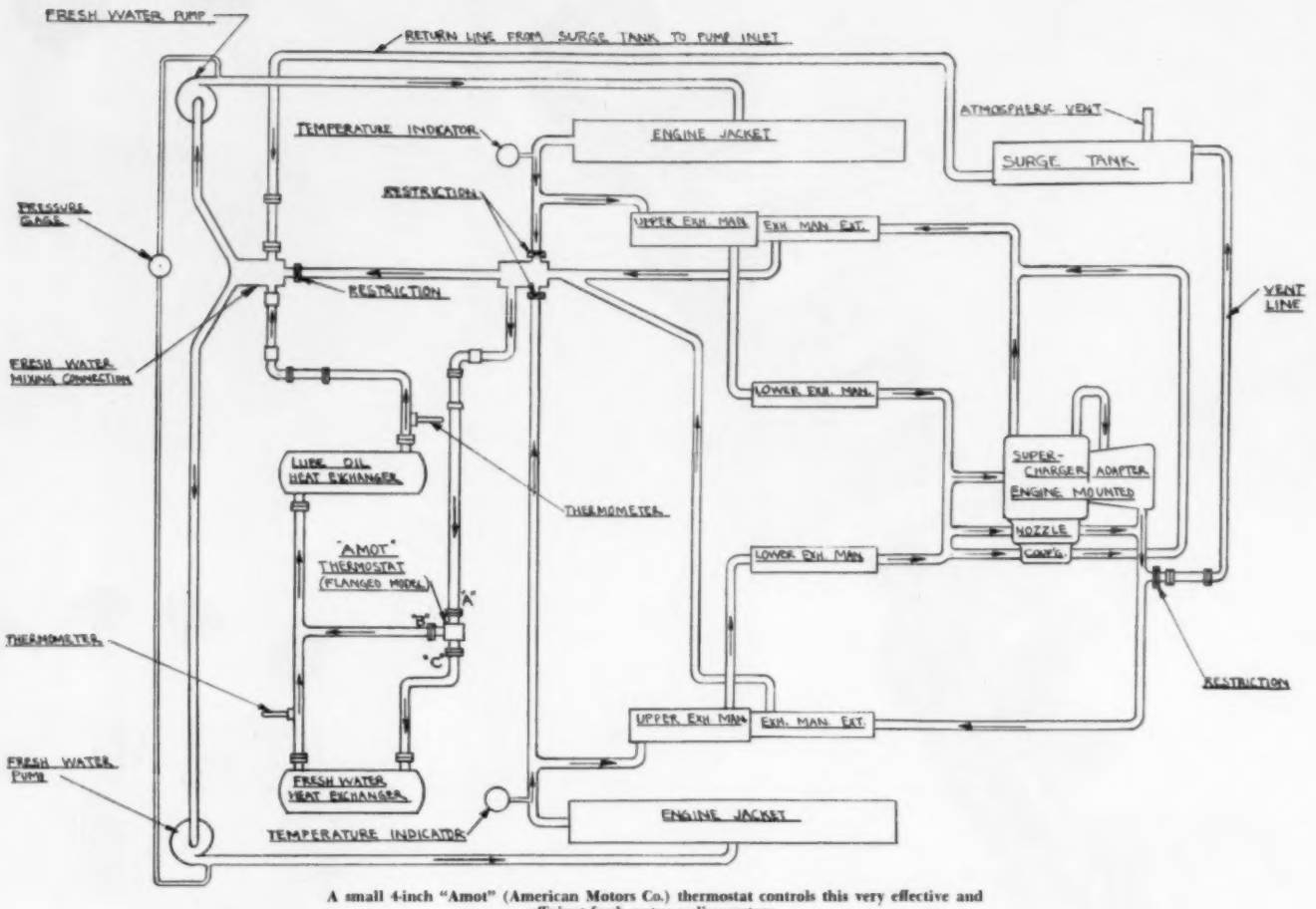
Panish POSITROL with mechanical clutch and throttle interlocks—twin engine unit—side by side group mounting.

Panish POSITROL diesel engine start-stop-run governor control unit, single engine unit.



CONDENSED MECHANICAL SPECIFICATIONS
PACKARD SERIES 142 DIESEL ENGINES

	Six	V-12 (60 deg.)
Type	Four cycle, full diesel, with precombustion chamber, supercharged.	
Bore (in.)	5⅜	5⅜
Stroke (in.)	6¼	6¼
Displacement (cu. in.)	852	1704
Compression Ratio	15 to 1	15 to 1
Rated Speed (rpm.) continuous	2000	2000
Rated Bhp. continuous duty (supercharged)	300	600
Bmep., continuous rating	140 psi., supercharged	140 psi., supercharged
Power take-off	Flywheel and flywheel housing on engines with gear boxes and generators. Hydraulically operated reverse gear for marine installations, with reduction gears where required.	



A small 4-inch "Amot" (American Motors Co.) thermostat controls this very effective and efficient fresh water cooling system.

toward the center where it is directed by baffles up and around a tube into the water outlet header formed in the camshaft housing. From the camshaft housing water header, the cooling water enters the upper exhaust manifold inlet elbows where the flow is divided, part of the water by-passing the manifolds and going direct to the exhaust manifold by-pass tee, the other part entering the water jackets of the upper exhaust manifolds. The part directed to the lower exhaust manifolds is carried to the fresh water inlet at the bottom of the supercharger. At the by-pass tee the water from the manifold jackets is brought together with that which was by-passed around the manifolds. Leaving the by-pass tee, the combined flow is again divided, part going to the thermostat and thence to the heat exchanger, the other part by-passing the heat exchanger and going direct to the transfer connection.

A flow restriction in the hot water inlet to the transfer connection is sized to proportion the flow to the heat exchanger so that when the over-cooled water from the heat exchanger is mixed with uncooled water from the engine the combined flow is at the proper inlet temperature.

The fresh water expansion tank, the fresh water thermostat and the fresh water and lube oil coolers are not attached to the engine. From the engine fresh water outlet the portion of the water to be cooled is piped to the thermostat. When the engine is cold, the thermostat is closed and all of the water flows through the thermostat by-pass around the fresh water cooler. As the water becomes warm the thermostat starts to open, allowing some water to go through the fresh water heat exchanger and some through the by-pass.

The thermostat is a self-contained by-pass type unit consisting of a sliding valve actuated by a solid expansion type power element housed in a cast aluminum case with 2-inch flanges for mounting in the cooling water piping system. The power unit utilizes the expansion of a special thermostatic material which is highly sensitive to temperature changes. Expansion of the thermostatic material, created by a rise in temperature, develops a pressure that is transmitted directly to the sliding valve, moving it to decrease the opening of the by-pass ports. Changes in pressure do not affect the element and due to the sliding valve construction, surges in pressure do not upset the stability of the thermostat. The temperature range of the element is 155 to 172 degrees which is set by the manufacturer.

Packard officials are quite mindful of the commercial possibilities of these fine engines. Looking to the future the Company is planning later to develop V-eight cylinder and V-sixteen engines using the same basic 142 cu. in. cylinder as that employed in the sixes and V-twelves thus exploiting to the fullest extent the large number of interchangeable parts common to the entire line of engines.

List of Equipment

Aluminum Castings—Aluminum Company of America and Bohn Aluminum Co.
Bearings—Main and Connecting Rod—Allison Division, G.M.C.
Connecting Rods—Forged and finished by Packard.
Controls—Westinghouse Air Brake, and Panish.
Crankshafts—Forged by Wyman Gordon.
Filters—Air—Air-Maze Corp.
Fuel—Purolator.
Lube—Fram.
Lube Strainer—Purolator.
Fuel Injection—American Bosch.
Fuel Line Fittings—"Ermeto"—Weatherhead Co.
Governors—Speed Regulation—Woodward.
Overspeed—Packard.
Heat Exchangers—Intake Air—Harrison.
Lube—Harrison.
Water—Ross.
Pistons—Aluminum Company of America.
Pumps—Oil & Water—Packard designed—parts furnished by Sherwood Brass Co.
Sea Water—Gear type—Sherwood Brass Co.
Rings—(piston)—American Hammered.
Starting—Electric and Air—Leece-Neville.
Starting—Capsules (Chevron)—California Oil Co.
Thermostat—"Amot," American Motors Co.
Turbocharger—General Electric.
Valves, Sodium Cooled—Eaton.
Vibration Damper (Viscous)—Houde.
Pyrometer—Alnor.

WESTINGHOUSE AIR BRAKE CONTROL SPEED SYSTEM ON PACKARD MARINE DIESELS

THE Westinghouse Air Brake pneumatic speed control equipment, used on certain Navy applications of Packard diesels, consists essentially of a remotely located pressure modulating device connected by means of suitable tubing to a pneumatic positioning device mounted upon the engine and connected by linkage to the engine governor. The pressure modulating device or CONTROLAIR Valve is handle or wheel operated by either the pilot or the engineer to deliver a pressure between 10 and 60 psi, depending upon the amount of handle movement, to the pneumatic positioning device or ACTUATOR. The ACTUATOR will assume a definite position for each increment of pressure variation and will position the engine governor to provide the speed desired by the operator.

To explain the operation of the pneumatic speed control equipment let us assume that four engines have been started and are set up for propulsion. It is also assumed that pilot house control is desired of the four engines to be used for propulsion on the two propeller shafts. To arrange the system for this type of operation, it is necessary to position the transfer valves, Items 5 and 9, as follows.

1. The ROTAIR Valves, Item 5, must be placed in REMOTE position. This will connect port 4 to port 2, so that the ACTUATORS on each bank of engines are connected to same source of control pressure. Thus the two ACTUATORS on each bank of engines will operate simultaneously.

2. The ROTAIR Valve, Item 9, must be placed in REMOTE position. This will connect port 1 to port 3 and will permit supply pressure to pass through the valve to the pilot house control stand. On REMOTE position port 2 will be connected to exhaust so that the engine room CONTROLAIR Valves, Item 3a, for the inboard engines will be connected to exhaust and will be ineffective. This will be indicated by the gages, Item 10, in the engine room control stands. These gages will show zero pressure with Item 9 in REMOTE position.

With the transfer valves positioned as above, we can trace the path of supply air through the control system. Supply air at a pressure of 100 psi is obtained from the ship's supply through the ¾" Vented Cut Out Cock with Side Vent, Item 11. This cock is so constructed that in the closed position the supply air is cut off and the control system is vented to atmosphere through a side vent in the cock. From this point, supply pressure passes to port 1 of the ROTAIR Valve, Item 9, and to the engine room control stands.

At the engine room control stands the supply pressure passes to the IN port of the CONTROLAIR Valve, Item 3b, for the generator engines and to the IN port of the CONTROLAIR Valves, Items 6, used to provide synchronizing pressure for the Actuators, Item 8, or the generator engines. Even though supply pressure is available at the generator engine CONTROLAIR Valves, Item 3b, they can have no effect on the control system, since their delivery is intercepted at port 3 of the ROTAIR Valves, Item 5, when in REMOTE position.

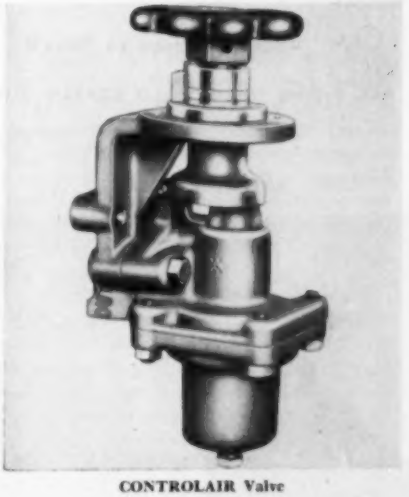
The supply pressure at port 1 of the ROTAIR Valve, Item 9, will pass through the valve and out port 3 to the pilot house control stand. Pressure will be present at the IN port of both the port and starboard CONTROLAIR Valves Item 1, and the gage, Item 2. The pressure indication of this gage will serve to show that the pilot house has control of the engines.

The speed of the two engines on the port shaft or the two engines on the starboard shaft can now be controlled by operating either the port or starboard CONTROLAIR Valve handle between the IDLE and FULL SPEED positions. In IDLE position the CONTROLAIR Valve will deliver approximately 10 psi. pressure, while in FULL SPEED position the delivery pressure will be approximately 60 psi.

SPEED line pressure proportional to the amount o. CONTROLAIR Valve handle movement will pass from the OUT port to the engine room where it will be effective at the Double Check Valve, Item 4. Since there is no pressure on the engine room side of the Double Check Valve, the pressure from the pilot house will move the shuttle of the Double Check Valve over to seal off the engine room side. SPEED pressure will then pass out the side outlet of the Double Check Valve directly to the control diaphragm of the Actuators, Item 7. At the same time SPEED pressure will pass to port 4 of the ROTAIR Valve, Item 5. Since the ROTAIR Valve is in REMOTE position, SPEED pressure will pass from port 4 out port 2 of the ROTAIR Valve to the main control diaphragm of the Actuator, Item 8. Thus the two Actuators on each bank of engines will be operated simultaneously from the pilot house CONTROLAIR Valve.

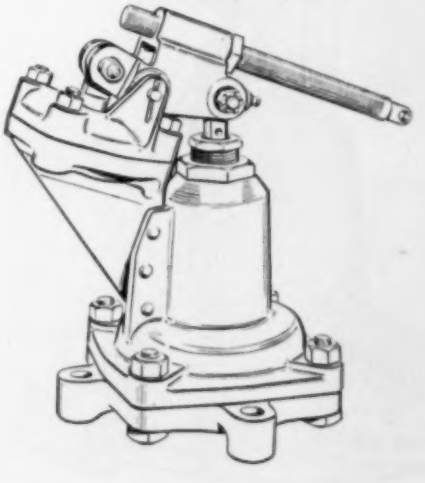
Since this installation involves two engines operating on a single propeller shaft, it is desirable to provide a means of synchronization to divide the load equally between them. This is the purpose of the CONTROLAIR Valves, Item 6, which are connected to the auxiliary diaphragm of the Actuators, Item 8, installed on the port and starboard generator engines. Normally with no pressure on the main control diaphragm of the Actuator, the CONTROLAIR Valve delivery pressure is adjusted to its mid-valve by positioning the adjusting

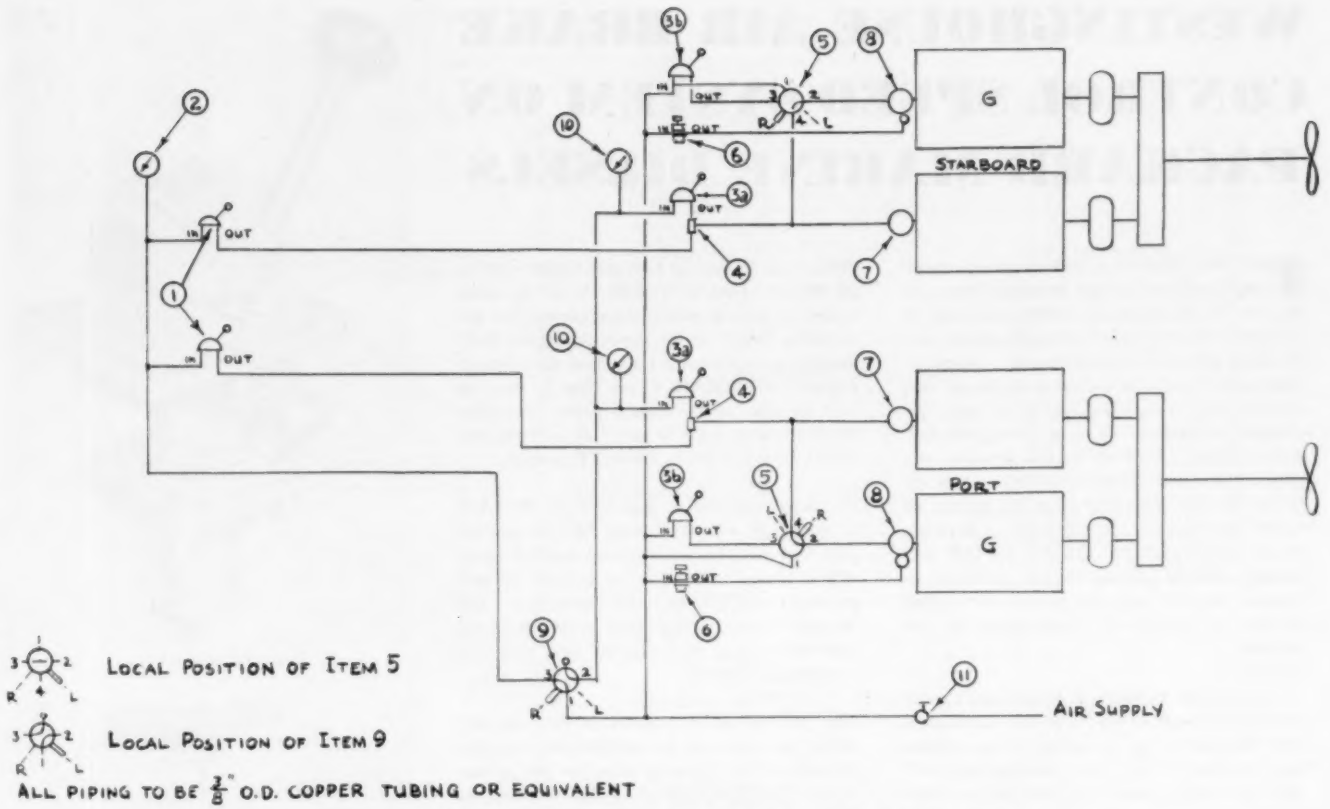
CONTROLAIR Valve



CONTROLAIR Valve

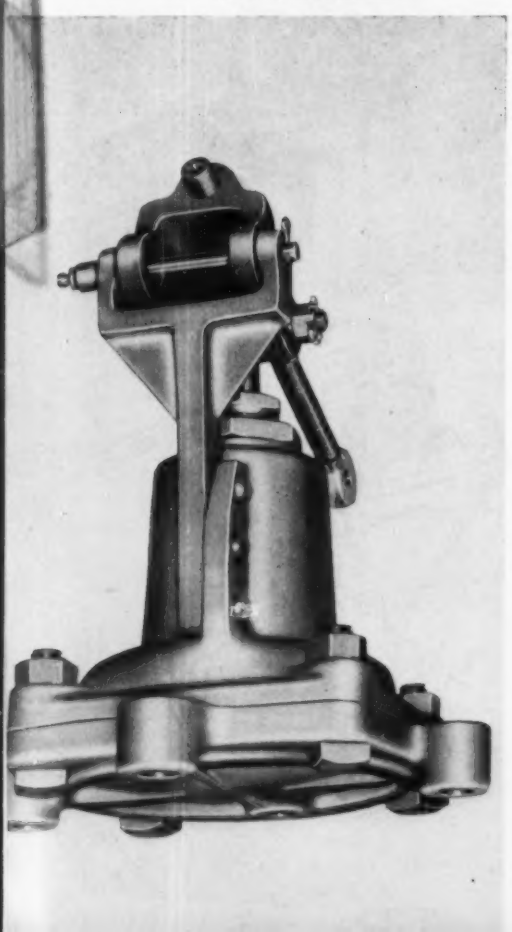
ACTUATOR - Positioner





Westinghouse Air Brake Pneumatic Speed Control System, for 4 Packard Marine Diesel Engines.

ACTUATOR - Positioner



wheel at the half way point of its travels. Thus after a speed change has been made from the pilot house and the engineer determines that one engine is taking more than its share of the load, he can operate the CONTROLAIR Valve to make the engine with which the Actuator is associated take more or less load. By increasing or decreasing the pressure applied to the small auxiliary diaphragm of the Actuator the speed of the generator engine can be mastered to that of its companion engine. A variation of plus or minus 10% in the Actuator positioning is possible with the synchronizing control.

The speed control system can be operated from the engine room in the same manner as that described for pilot house operation. To arrange the system for master control from the engine room the transfer valves must be positioned as follows: 1. The ROTAIR Valve, Item 9, must be placed in LOCAL position. This will connect the 100 psi supply pressure at port 1 to port 2 and at the same time will connect the pilot house control stand to exhaust through the ROTAIR Valve. 2. The ROTAIR Valves, Item 5, must be placed in REMOTE position as before.

With this arrangement 100 psi. supply will be furnished to the IN ports of the CONTROLAIR Valves, Item 6, and the CONTROLAIR Valves, Item 3b. These CONTROLAIR Valves will have no effect upon the system since their delivery will be cut off at port 3 of the ROTAIRS, Item 5. Supply pressure will also be furnished through the ROTAIR Valve, Item 9, to the CONTROLAIR Valves, Item 3a, and gages, Item 10. The pressure reading on the gages will serve as an indication that the engine room has control of the system. The pilot house gage, Item 2, will now show zero pressure indication that the pilot house is no longer in control of the system.

Operation of the system will now be identical to that already described for pilot house control, except that master control of the engines will now be vested in the engine room CONTROLAIR Valves, Item 3a. Engine synchronization may be accomplished in the same manner as that previously described.

The flexibility of the pneumatic speed control equipment should now be apparent. Depending upon the manipulation of the ROTAIR Valves the following types of control are available:

Type of Control Desired	*Position of ROTAIR Valves*	
	Item 9	*Item 5*
1. Pilot House-Master Control	Remote	Remote
2. Engine Room-Master Control	Local	Remote
3. Engine Room-Individual Control of Generator Engines	Local	Local
4. Pilot House-Individual Engine Room Control of Generator Engines	Remote	Local

The synchronization controls are effective under all of the above operating conditions.

ELECTRO-MOTIVE COMPLETES A TRULY WORLD-RANGE ALL PURPOSE DIESEL

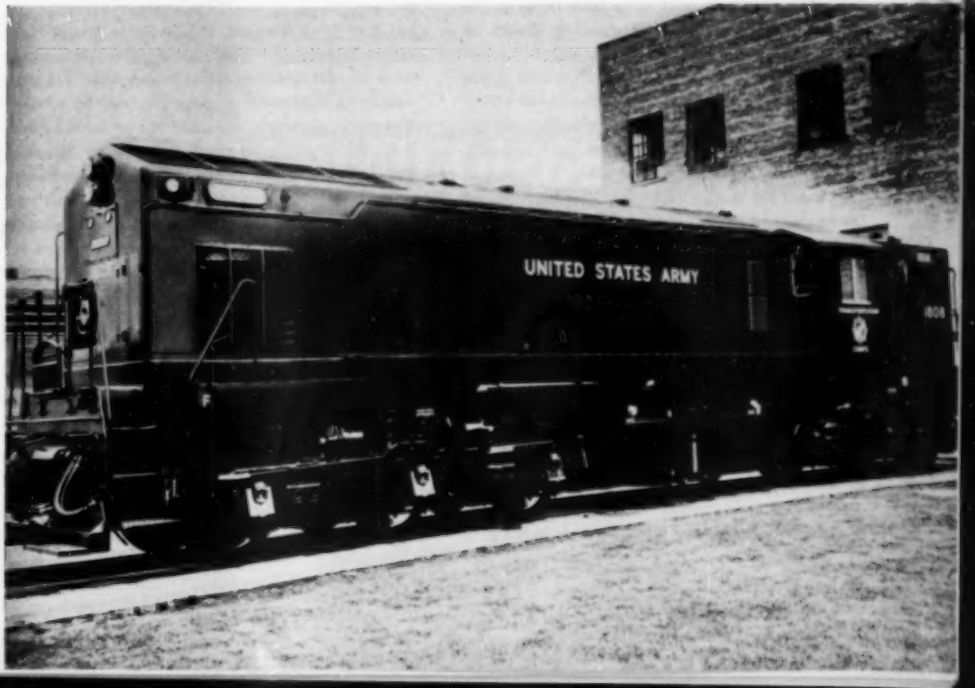
By CHAS. F. A. MANN

FRESH out of the big La Grange Electro-Motive Diesel locomotive plant is the first of what is classed as a world-range diesel locomotive as nearly all-purpose in type as can be built, and the first of its kind. Last month the writer had the privilege of watching final completion stages on this novel diesel locomotive that is one of a fleet of 13 designed to meet the U. S. Army Transportation Corps specifications of a locomotive that will run anywhere in the world on standard or standard plus (wide) gauge track of practically any weight of rail from 60 lbs. upward.

Of particular interest because of the great savings to the beat-up U.S. taxpayer, was the fact that research and development on this diesel was based on the traditional General Motors policy of making every component part of the diesel as well as the running gear standard and interchangeable to the highest degree possible to visualize on the drawing board. Thus, about 85% of the Army world range diesel, given the formal name of Military Road Switcher No. 1, was drawn from standardized parts. The Army people thus saved upwards of a half million in research and production first costs on the locomotive, and delivery time was accelerated by many months. A second important factor in this interesting locomotive arose when the Milwaukee Railroad had long considered ordering a fleet of 1600 hp. road-switchers with very light axle weights for use on 60-75 lb. lightweight branch lines out West. Thus, it was able to contribute to the cost-reduction on both its and the Army's orders going through production almost simultaneously.

The Milwaukee's units, first of which went out in May, are likewise 6-wheelers with light axle loading, and full-size cabs and full width engine platforms, to utilize the roomy U.S. clearance limits. The new Army MRS-1 series are designed with wheels, axles and bearings that permit quickly changing gauge from anything between American standard to Rusisan 6 ft. in a matter of hours. Scavenging and oil, water and air auxiliary equipment permit operation in temperatures from 40 below to 125 above zero Fahrenheit. The diesel, a regular 16 cylinder GM 1600 hp. unit, can run on anything from regular diesel down to 40 cetane oil, and even lower grades in emergencies. The new world-range Army diesel will haul passenger, freight, mixed or run as a switcher. Space for heating boiler is provided in the small after cab back of the operating cab. Axle loadings are cut down to 41,000 lb. for use on light rail and bridges on foreign lines. All six axles have driving motors. The usual U.S. diesel runs close to 60,000 lbs., yet the Army diesel has more complex machinery inside a much smaller cab. Weight reduction was accomplished largely in car bodies, truck frames, and running gear. The cab height has been cut down to 13½ feet and the maximum width to 9 ft. 8 inches. Top speed is 77 mph. All types of couplers used on various world railroads can quickly be substituted for the U.S. type coupler, and all braking systems can be worked with the new diesel as easily as the latest type of U.S. brake.

In addition to the Milwaukee Railroad's orders for this locomotive (See DIESEL PROGRESS, August 1952), forty of these versatile units have been sold for the meter-gauge portion of the Eastern Bengal Railway system in eastern Pakistan. These locomotives were similar in design to the Milwaukee's units but differed in size.



WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

Hamish Ferguson was appointed secretary to the Diesel Engine Users Association in London in 1944. Previously senior technical assistant to Diesel and Insurance Consultants, London, and for several years with English Electric Company in the designing and erection of large diesel generating plants. Mr. Ferguson continues to do independent consulting work.

THE writer is pleased to record the triumphant welcome given to the S.S. *United States* at Southampton on July 8th, 1952, on the completion of her record-breaking maiden voyage. The British Press party invited aboard were impressed by her performance and the many novel features of construction and decoration. There can be little scope for diesels in a ship such as this but it was satisfying to find that General Motors generating sets had been installed to provide services when in port or during an emergency, proving that the most suitable type of prime-mover had been utilized for each of the many duties which might be required in a passenger liner or troopship.

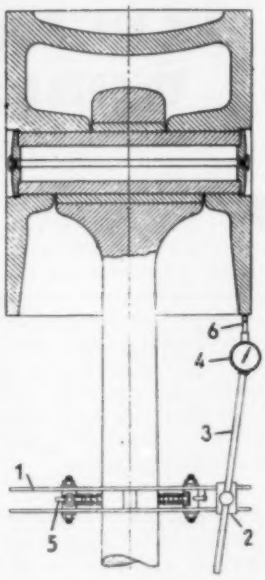
Where the larger engines are concerned, the checking of big-end and gudgeon-pin bearing clearances can be a tedious and expensive business if a complete piston and connecting-rod have to be removed so that feeler gauges and lead wire can be employed. During a major overhaul the piston would be removed in any case but, even so, the lead wire method for gauging big-end clearances is considered by many to be unreliable. There may be occasions between overhauls when a bearing is suspect, and to be able to assess the running clearance before dismantling would be an obvious advantage. With these points in mind the Adam Play Indicator was devised and it has now proved its usefulness both ashore and afloat.

The equipment is uncomplicated and compact. Its assembly for checking big-ends is shown in Fig. 1 and for small-ends in Fig. 2. The same dial micrometer can also be used for checking crankshaft alignment, and for gauging cylinder wear.

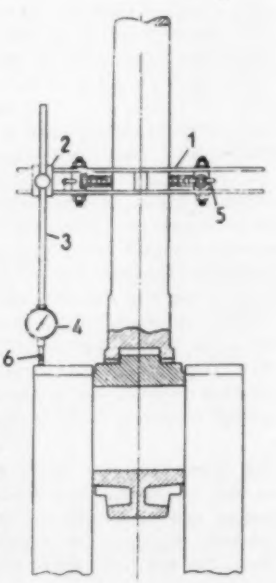
For checking big-end and small-end bearings the procedure is as follows: Two rigidly connected steel bars with a roller chain form the clamp (1) which can be attached to a connecting-rod of any diameter. The clamp automatically positions itself at right angles to the axis of the rod. Through a slidable carrier (2) passes the rod (3) which carries the dial micrometer (4) calibrated to record measurements of 0.0005 in. Having set the dial to the zero reading it is then necessary to lift the connecting-rod and big-end bearing to determine its clearance or alternatively to lift the piston and gudgeon-pin to obtain the small-end clearance. In either case the simplest method is usually to arrange a lift from an overhead crane, and if the cylinder head has been removed this method would be recommended. However, in cases where it is inconvenient to remove the head it is easy to contrive to raise the big-end bearing by jacking-up from the interior of the bedplate or, to check the small-end, to raise the piston and gudgeon-pin by jacking-up from the crankweb at either side.

For the checking of crankshaft alignment the dial micrometer is used in conjunction with the spring loaded attachment (7) and the pointed rod (8) which is cut to length to suit the engine under inspection. The micrometer is set to the zero reading with the crank at bottom dead centre and the engine is then barred round to enable further readings to be taken at the 3 o'clock, 9 o'clock and 12 o'clock positions. If the crankwebs close in at bottom centre this will normally indicate that the bearings either side are low, but a high outboard or flywheel bearing will have the same effect. When the piston and connecting-rod have been removed, it is usual to mount the gauge about ¼-in. from the edge of each web in a central position. If, however, the engine cannot be dismantled a check can still be taken. The gauge should be mounted again about ¼-in. from the edge of the crank webs but in a sideways position so that it just clears the connecting-rod when at bottom dead centre. On barring round it will be found possible to obtain readings at 3 o'clock, 9 o'clock and 11 o'clock (approx.) without the gauge being disturbed by the connecting-rod. These readings will provide sufficient guide as to crankshaft alignment in most cases.

For measuring cylinder wear the dial micrometer is used in conjunction with a foot member (10) which is kept stationary and provides two-point contact with the cylinder liner. The equipment was devised and patented by Mr. H. D. Adam, 85, Gracechurch Street, London, E.C.3., who rightly states that "it is foolish to disturb a bearing which is in sound condition."

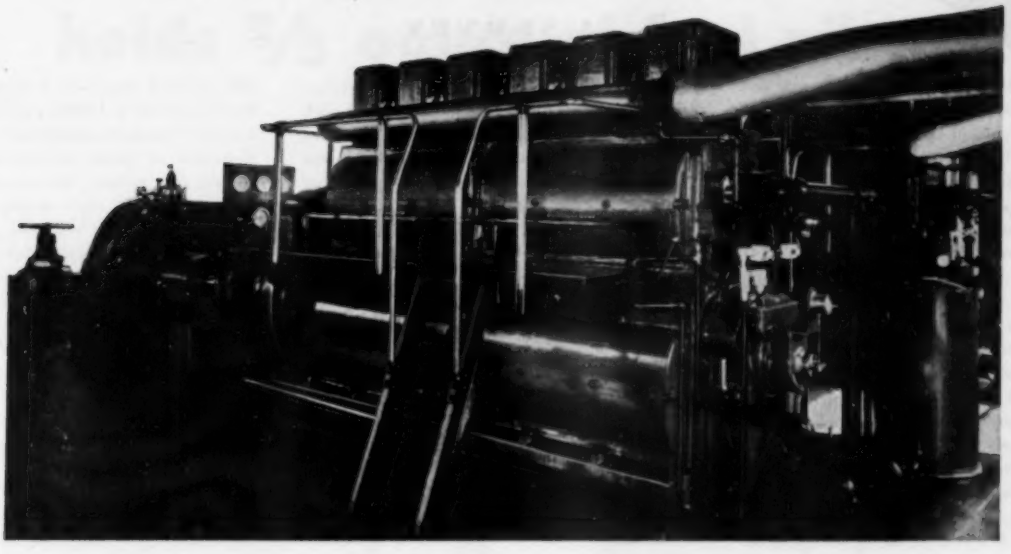


The instrument in use for determining the clearance between the gudgeon pin and the small-end bearing of the connecting rod.



The instrument in use for ascertaining clearance in the big-end bearing. The dial micrometer is rigidly attached to the connecting rod while the plunger (6) of the "clock" bears upon the crank web.

at the Anthony Station of Magnolia Pipe Line...



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Supervising & Operating Engineers Section

CONDUCTED BY R. L. GREGORY

A SURVEY

Foreword: DIESEL PROGRESS has recently received a copy of a talk, prepared and presented to the spring conference of the Nebraska Municipal Utilities, by Mr. L. E. Clark, Supt. of the Broken Bow, Nebraska, Municipal Utility. While the paper is too lengthy to present in its entirety, your writer has picked out excerpts from it that will be of interest to our readers.

MY remarks will be those of a layman, whose hobby has been to dabble a little bit with the untried, yet who likes to keep his feet on the ground. Since the plant at Broken Bow has had dual fuel engines in operation only a little over a year, one can hardly call this a graduate study. There are approximately 21 dual fuel plants in Nebraska that have engines operating or have them on order. I contacted these plants, sending each a questionnaire and 17 of them replied. These plants are listed on the first page of the survey and show seven manufacturers represented with sizes of units ranging from 325 to 2800 hp.

We are almost all using diesel engines that were designed for fuel oil operation, then modified for use with natural gas. In time this equipment will probably be completely redesigned to make possible the fullest use of natural gas and to more nearly match its characteristics. Since so much heat and so much energy now go to the exhaust, why isn't it reasonable to lengthen the stroke of the piston and make use of more of that energy? Other means of confining this energy to the production of power, as you have already been told by the preceding speaker, are high pressure supercharging and the increasing of jacket water temperatures. Most of this is above the level of the average operator and we are therefore dependent on the manufacturers for many of these developments. Now for a one man analysis of dual fuel equipment. Never before have plant operators and managers been challenged with problems and possibilities so intriguing. Natural gas has many of the qualities of the perfect engine fuel. It is clean, hence there are no filter or dirt problems. It has good ignition and burning qualities as evidenced by the quieter operation of an engine when it is switched to gas operation. We will leave the matter of detonation out of our discussion till a little later. Carbon formations are usually much less than that found in other fuels. Most natural gas is low enough in sulphur content to give little trouble at today's operating temperatures. The use of this fuel is safe if reasonable precautions are taken.

If all of this is so perfect, where do our problems come from? The average plant, even under good operating conditions, requires about 10,000 btu.'s of wet heat value in natural gas to produce one kwh. of electrical energy, which in turn is equivalent to 3415 btu.'s. In other words we have lost ⅔ of our energy before we get started, even though our fuel costs which we brag about, may be down to three mills or less. In present day operation our energy goes three ways, ⅓ to power, ⅓ to cooling and ⅓ to exhaust. Heat from exhaust gases offers one of the big opportunities for savings. Exhaust gases leave the cylinder at 800 to 900 degrees as a rule. If the engine is supercharged, considerable energy may be consumed for that purpose, and temperatures may drop down to 400 degrees after passing through the turbine. There is still a lot of heat left that is capable of producing low pressure steam or hot water, if use for these items can be found. The energy in the jacket cooling water can also be recovered to preheat water for production of steam or other purposes. Those are the outside possibilities. Internal improvements are possible and will be forthcoming from the manufacturers in due time.

The majority of us can do more, percentagewise, to increase the efficiency of our own plant than the manufacturers can ever hope to do. The manufacturer has really done something when he raises thermal efficiency as much as 1 or 2 per cent. But what about us? Some of us are operating at 19,000 btu. per kwh. when with a little effort this figure can be reduced to 10,000 or 11,000 btu. and under the right conditions much lower. For hundreds or thousands of dollars the manufacturer gets a 1 percent improvement, yet your difference between 19,000 and 10,000 btu.'s or approximately 40 percent may be secured with only a few more meters and instruments or maybe a little more application and study of the proper corrective measures. There are many very fine dual fuel and diesel generating plants in operation in the state of Nebraska. You men, who are responsible for these plants, should have the credit that is due you. You are using equipment that is so new in many instances, that it is hardly out of the experimental stage. Some of us may not be getting that cheapest kilowatt just because we have not had the time to gain the needed "know-how" for operating this new equipment. A number are getting the job done and have those btu.'s down where they belong.

Here I am reminded of my subject last fall, pertaining to instrumentation and records. If we are to know just where we are, we must be able to produce efficiency figures for daily operation. Thus, the results of adjustments and improvements become immediately evident. A most important instrument

Tabulation of Questionnaire From 17 Plants Reporting
SURVEY OF DUAL FUEL ENGINES IN NEBRASKA

		Yes	No
Is Engine supercharged?		9	7
Metering			
Is your equipment separately and fully metered for fuel oil, gas, kwh., time, etc?		12	3
Do you have a gas flow meter?		10	6
Do you need a gas flow meter?		9	6
Can you and do you determine accurately and regularly the btu.'s per kwh. for gas and pilot oil?		10	6
	Low	*High*	*Average*
What are the figures? Gas	8,295	17,100	10,981
What are the figures? Pilot Oil	944	1,900	1,427
What are the dollar savings per year?	$5,520	$36,000	$20,577
What percentage of pilot oil is used?	5%	16%	9.5%
What is your gas rate per m cu. ft.?	20.5	31.2	26.9
Maintenance	*Undetermined*	*Yes*	*No*
Is maintenance lower than diesel operation?	2	9	3
Is lubricating oil consumption lowered?		12	3
Is winter operation superior to summer operation?		9	4
Do you have a detonation?		10	5
Do you consider your engine dangerous in any respect?		3	12
How much time do you operate on diesel to keep your nozzles clean?	*None*	*15 Min. per day*	
	3	9	
Operation		*Yes*	*No*
Was your regular fuel oil suitable for gas operation?		11	3
What fuel do you use for pilot oil?	*No. of Plants*		
No. 1 Diesel Fuel Oil	4		
32-36 Gravity Gas Oil	3		
28-30 Gravity Gas Oil	1		
26-28 Gravity Gas Oil	1		
U.G.I. Dark Distillate	1		
24-26 South Texas Crude	2		
Will your engine operate on gas properly on both light and heavy loads?		11	4
Will your engine pull its rated load on gas when temperature is above 90 degrees?		5	8
Can you and do you regularly adjust manifold air supply for the most economical operation?		8	6
Are there other adjustments that you feel should be made, manual or automatic?		6	6
Improvements			
Are you considering intercooling or other type of cooling?		3	9
Do you feel that something educational should be promoted along this line?		12	0

This test tube holds 3/5 ounce of fuel oil

enough to haul

one ton

three miles

when used in a General Motors Diesel locomotive

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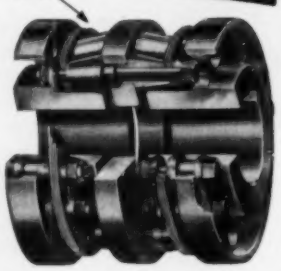

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NO MAINTENANCE PROBLEMS.
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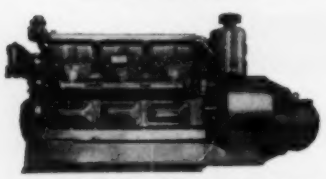

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WARREN, PENNSYLVANIA

is a gas flowmeter. Nobody has been able to produce a reliable and cheap fuel oil flowmeter for flows as low as those required for pilot oil. I might suggest that if available, such an instrument also would be of great value particularly in diesel operation. I will cite some of our own experiences in Broken Bow to give you some idea of the value of a flowmeter. Our original installation which was made a little over a year ago did not include flowmeters. Due to the fact that engineering data for our particular engines had never been compiled for operation at low temperatures, the original adjustments were made, based on higher ambient temperature operation. This resulted in a consumption of natural gas which was more than 20 percent too high. After several weeks operation, we built our own flowmeters and were able to make the proper adjustments in just a matter of minutes. This becomes a very simple procedure when you can observe immediately the effect of what you have done. If your adjustment improved operation, the gas flow as shown by the meter will be immediately reduced, or visa-versa. Probably the most important adjustment to be made frequently, in so far as economy is concerned, is that of regulating the incoming air. So many variables enter the picture, that at present it is hard to adapt a control for air that will be entirely automatic. Various types of automatic controls are installed on the various makes of engines. Some are controlled by the governor, a servo-motor or a thermocouple connected in the exhaust, and some have manual controls.

To obtain the highest efficiency, we need just the right amount of oxygen, and either too much or too little will lower that efficiency figure. The barometer, the ambient temperature and the humidity will all lend to the problem of regulation. The colder the air, the greater the available oxygen per cu. ft. and thereiore less air will be needed for proper combustion in cold weather. By keeping the amount of air to be compressed by each stroke of the piston down just to this minimum, it decreases the wasted work being done and promotes top efficiency. Two cycle engines will need an additional amount of air for scavenging. Therefore you should show your best operating results in winter operation. Whatever automatic control you have, it should be augmented by manual adjustments or at least test checked at regular intervals. These adjustments will be related to the ambient temperature changes and can best be made with the use of a flowmeter.

I said I would get in my two cents worth about detonation. Everybody is going to have it when both the bmep.'s and the air intake manifold temperatures are too high. You may also have other reasons in your plant such as unbalanced cylinders, burning carbon, improper adjustments of gas, fuel oil or air. Without having too much background for my statement, I would say that most dual fuel engines will experience detonation when the intake manifold temperature exceeds 150 degrees together with loads in excess of 80 percent. Our opportunity in promoting efficiency and increased carrying capacity lies in serving the engine with the coolest air possible. First to consider is the source. Are you using air that has been heated by the exhaust stacks? Other heat may be picked up as it passes through the supercharger. Perhaps a separate source of cooling water for the supercharger can help you. A cooling method quite widely used is that of introducing a fine water spray into the incoming air stream. This often times accomplishes the purpose, but has the drawback of causing scale to form on the valves and other parts in the engine and it uses up some energy for vaporization of the water. Intercooling seems to offer the greatest possibilities both for existing units and future installations if we wish to squeeze out every available kwh.

In conclusion I would like to sum up the dual fuel situation. We have surely had a windfall in the obtaining of natural gas for fuel at present prices. Just because we suddenly can produce a kwh. for ½ a cent less, is no sign that we or our plants have suddenly become more efficient. Be sure you know your efficiency, then if it is not the best, do something about it. Modern plants require Instrumentation, Education and Application and I might add, records.

DUAL FUEL ENGINES IN OPERATION IN NEBRASKA

City	*Name of Engine*	*Type*	*Size*	*Included in Report*
Nebraska City	Nordberg	FSG-168-HSC	2120 hp.	Yes
West Point	Nordberg	FSG-166-SC	1320 hp.	Yes
Wahoo	Nordberg	8-DBT	1660 hp.	No
Wahoo	Nordberg	TSGL-217-31	2830 hp.	On order
Sidney	Nordberg	TSGL-218-31	3440 hp.	On order
Wayne	Nordberg	FSG-168-SC	1750 hp.	On order
Red Cloud	Fairbanks, Morse	33FD 16x20 FM	800 hp.	Yes
Wilber	Fairbanks, Morse	31A8½	1100 hp.	Yes
Crete	Fairbanks, Morse	33F16	1600 hp.	Yes
Crete	Fairbanks, Morse	33D	1200 hp.	Yes
Falls City	Fairbanks, Morse	31AD18	2800 hp.	Yes
Paxton	Fairbanks, Morse		420 hp.	Yes
Blue Hill	Fairbanks, Morse	31AD8½	325 hp.	Yes
Sidney	Fairbanks, Morse	33F16		No
Deshler	Fairbanks, Morse			No
Blair	Fulton	17½x24½ 277 rpm.	1165 kw.	Yes
Sidney	Fulton	BGSS	1980 hp.	Yes
Ord	Fulton		1695 hp.	Yes
Ord	Busch-Sulzer	8-DBT	1490 hp.	Being converted
Wayne	Superior	120 bmep.	1440 hp.	Yes
Chappell	Superior		1440 hp.	Yes
Tecumseh	Cooper-Bessemer	JS-8-GDT	750 kw.	No
David City	Worthington Corp.			No
Alma	Enterprise	Type G	600 hp.	No
Broken Bow	Enterprise	DGSQ 36	1140 hp.	Yes
Broken Bow	Enterprise	DGSQ 38	1460 hp.	Yes

Why the leaders prefer

PUROLATOR

FULL-FLOW

MICRONIC FILTERS

✓ **Full-flow rates within practical filter dimensions:** The famous "accordion-pleated" Micronic* filter element has up to ten times more filtering area than old-style filters—gives high flow rates in a minimum of space.

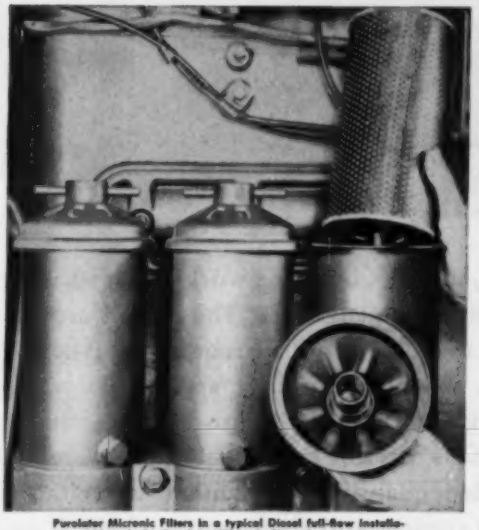
✓ **Ultra-micronic filtration:** High flow rates are, of course, meaningless unless effective filtration is maintained, too. Electron micrographs prove that the Purolator* Micronic filter stops particles down to *submicrons*—.0000039 in.!

✓ **Maximum dirt storage capacity:** The pleated design of the Micronic filter element provides many times more dirt storage space than old-style filters. This important advantage means uniform, efficient performance and a lengthy service life.

✓ **Minimum pressure drop:** The Purolator Micronic filter element introduces a remarkably small pressure drop in the lubricating system . . . permitting pumps of practical size and simple type.

✓ **Will not remove or absorb additives:** With Purolator Micronic filtration, you keep *all* the oil quality you pay for. The Micronic filter element will not strip additives . . . an important advantage with modern HD and heat-resistant oils.

*Reg. U. S. Pat. Off.



Purolator Micronic Filters in a typical Diesel full-flow installation. Although the Purolator Micronic filter elements measure only 4½ in. by 9 in., each one filters 9 gallons of oil per minute, giving a total of 27 g.p.m. for the complete filter unit.

THE advantages of Purolator Full-Flow Micronic filtration—wherein *all* the oil is filtered *each time* it passes through the engine—have been dramatically demonstrated during the past few years. In some instances engine life has been increased by thousands of hours, bearing and ring wear has been reduced to almost imperceptible minimums, and engines have been made to operate efficiently where air-borne abrasives formerly destroyed them in a matter of hours. One after the other, leading makers of Diesel and gasoline engines and vehicles are adopting full-flow lubrication . . . and standardizing on Purolator Full-Flow Micronic filters. In some fields, manufacturers are finding that full-flow lubrication is becoming a necessary feature to maintain a competitive sales position.

Time and again, in impartial tests conducted by vehicle and engine manufacturers themselves, Purolator Micronic filters have been proved best on all counts . . . fineness of filtration, long service life, ease of servicing.

Our Engineering Department will gladly co-operate in helping you prove—*in your own way, on your own equipment*—that there is no finer filter made than Purolator. Simply write, describing your equipment and filter requirements.

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey, and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles

PUROLATOR
MICRONIC OIL FILTER
"FIRST IN THE FIELD OF FILTERING"

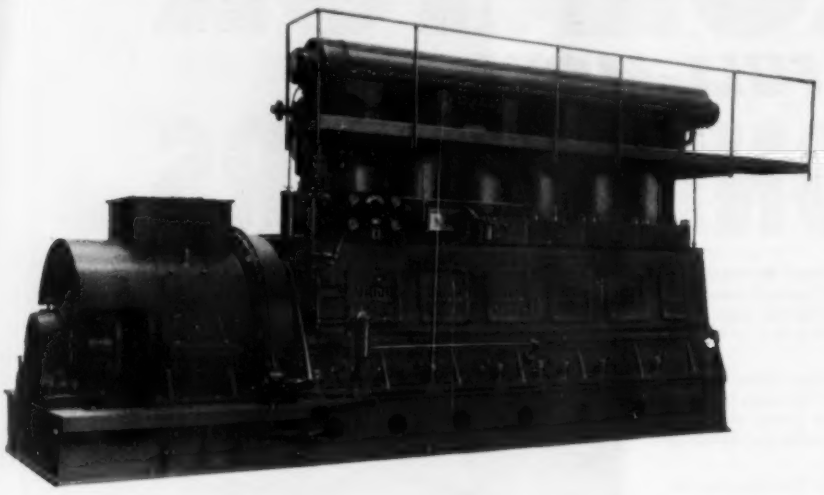
Heat Exchanger Bulletin

The Griscom-Russell Co., one of the largest exclusize manufacturers of heat transfer apparatus, has just published a bulletin on a finned tube heat exchanger with a particularly wide application for heating and cooling liquids and gases, and for condensing vapors. The bulletin fully describes this exchanger, known as the G-R Twin G-Fin Section, and explains the features of its design and construction that have proved to give highly effective service in installations totalling more than 70,000 sections. Complete construction details, specifications, dimensions, and installation arrangements of these standard interchangeable units are also included. A section of the bulletin contains many illustrations of representative installations on various types of duties, together with field reports of service records. Copies of the bulletin can be obtained by addressing The Griscom-Russell Co., Dept. EE, Massillon, Ohio, and asking for Bulletin 1400.

Diesel Plant Operators Course

A diesel plant operators short course is planned for October 27, 28 and 29, 1952 at Robert Allerton Park, University of Illinois. It is to be conducted by the Division of University Extension, in cooperation with the Department of Mechanical Engineering. Leading engineers will speak on diesel plant topics. The program will cover pertinent information on the operation and maintenance of diesel plants. Subjects to be discussed include: safety, combustion, lubrication, fuels, governors, dual fuel engines, plant operation characteristics, injection, pistons and rings, bearings, good housekeeping, preventive maintenance, indicators and indicator cards, engine cooling, diesel theory and human behavior.

All interested parties are invited to attend. For information concerning these courses and for housing reservations write Second Annual Diesel Plant Engineers and Operators Short Course, Robert Allen Park, Monticello, Illinois.



UNION, in 1885, built the world's first successful liquid-fueled internal combustion engine • The UNION airplane engine was the first to meet endurance requirements of the United States Aeronautics Testing Laboratory • A UNION was the first American-manufactured, exhaust-gas, supercharged, heavy-duty Diesel engine • UNION Dual Fuel Engines are used where simplicity, dependability and economy are paramount • Two UNION engines and an assembly which illustrate outstanding developments are on exhibit at the Smithsonian Institution in Washington, D. C.

Only UNION has been manufacturing quality internal combustion engines for more than 66 years

UNION DIESEL

2121 DIESEL STREET, OAKLAND 6, CALIFORNIA, U.S.A.

Generator Giant

Standing like a giant railway car wheel is this huge generator, built by the Large Motor and Generator Department of the General Electric Company for the Anglo-Lautaro Nitrate Corporation in Chile. Rated at 8750 kva., this unit, which will be driven by a 8950 hp. Nordberg diesel, is the largest of its kind ever built in the United States. One of two ordered to produce ac. power for the production of nitrate, this equipment weighs 86 tons, stands 21 feet high and measures 24 feet across. Like the generator, the diesel, which is a 12 cylinder, two cycle engine, is the largest ever produced in this country for this purpose.

Design Changes

Flexonics Corporation, formerly Cmicago Metal Hose Corp., Maywood, Illinois, announces significant design improvements in its Flexon expansion joints, and the addition of a three-inch size to the general line. New Flexon expansion joints in both controlled- and free-flexing types offer greater pipeline motion control with less overall expansion joint dimension required to handle a given amount of pipeline expansion. Exhaustive tests have proved that new Flexon expansion joints provide a maximum of motion commensurate with optimum life. For further information write Expansion Joint Division, Flexonics Corporation, 1325 South Third Avenue, Maywood, Illinois.

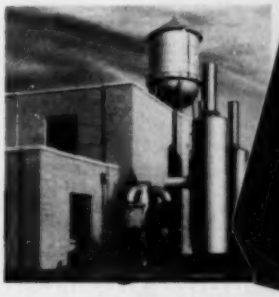
A Versatile PRODUCT TO MEET THE CHANGING NEEDS OF INDUSTRY

Keeping step with the dynamic movement of American business, Burgess-Manning has designed a versatile line of standard Snubbers. These Snubbers are designed to effectively reduce noise to the required noise level . . . AND . . . perform these additional functions: waste heat utilization, spark arresting, surge control, air cleaning, and water separation.

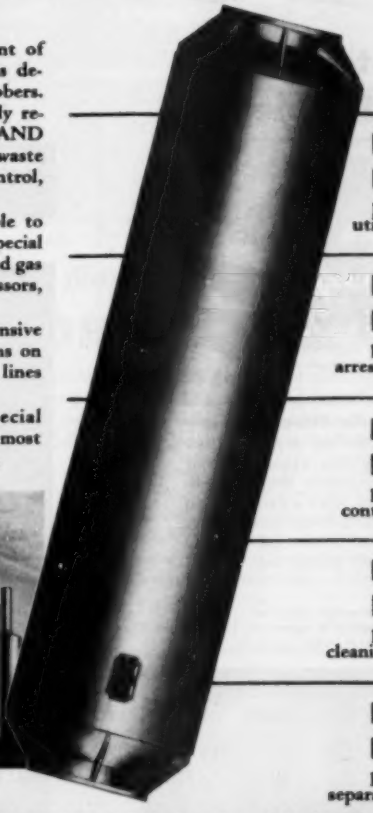
These standard Snubbers are available to meet the exacting noise reduction and special functional requirements of your Diesel and gas engines, jets, turbines, blowers, compressors, and vacuum pumps.

Burgess-Manning engineers have extensive experience in solving many noise problems on special applications for which standard lines are modified.

Our broad line of standard and special Snubbers allows us to recommend the most suitable unit for your specific application.



Burgess-Manning Snubbers installed at a power plant in Goodland, Kansas. There is a Burgess-Manning Snubber for every engine exhaust and compressor intake noise problem.



NOISE REDUCTION plus waste heat utilization Snubbers

NOISE REDUCTION plus spark arresting Snubbers

NOISE REDUCTION plus surge control Snubbers

NOISE REDUCTION plus air cleaning Snubbers

NOISE REDUCTION plus water separating Snubbers

BURGESS-MANNING COMPANY

749-A East Park Avenue

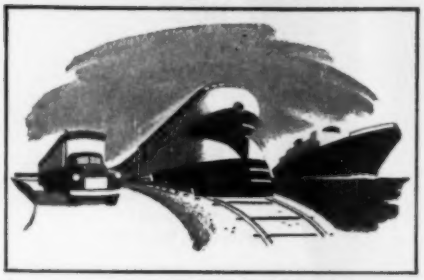
Chicago, Illinois — LIBERTYVILLE, ILLINOIS — Dallas, Texas

Bendix-Skinner

ORIGINATOR OF **MICRONIC** FILTRATION

the *Finest*

Answer to Any Filtering Problem



For over twenty years ***Bendix-Skinner*** has specialized in solving the filtering problems that "couldn't be done." From this experience has come entirely new and exclusive filtering techniques which do even the work-a-day filtering jobs better and at lower long-range cost. Tell us about *your* problem—nine times out of ten ***Bendix-Skinner*** filters will supply the "finest" answer.

***Over 350 Models** providing filtration from ½ micron (.000019") upwards at flow rates from 1 to 5000 g.p.m.*

Disc-type Ribbon-type Pleated-type

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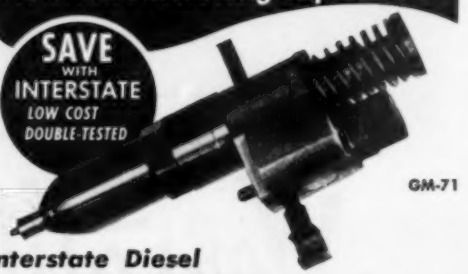
Bendix Aviation Corporation

Export Sales: Bendix International Division, 72 Fifth Ave., N. Y. 11, N. Y.

We are Experts in Re-Manufacturing Injectors!

SAVE WITH INTERSTATE LOW COST DOUBLE-TESTED



GM-71

Interstate Diesel Service Features:

1. *We ship immediately on receipt of your order. We do not wait for your unit.*
2. *Every part carefully inspected. Only genuine replacement parts used when needed.*
3. *All re-manufacturing work done in modern shop using the latest precision equipment.*
4. *Every unit thoroughly double-tested and guaranteed to meet the most rigid specifications.*
5. *FOR SMALL EXTRA CHARGE WE WILL CONVERT ANY INJECTOR FROM ONE SIZE TO ANOTHER.*
6. *60-70-80-90 and D96's available from stock. Exchange size for size.*

NOTE: Check our repair service on series No. 110 injectors, fuel transfer pumps and blowers.

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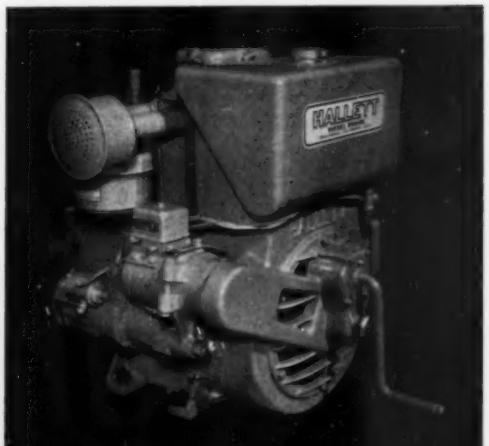
"AMERICA'S FINEST DIESEL COMPONENT REBUILDERS"



Model AC-1 Air Cooled 5HP Diesel Engine

HALLETT MANUFACTURING COMPANY

World's Largest Manufacturers of Low Horsepower Diesel Engines

1601 West Florence Avenue
Inglewood, California

HOW TO GET MORE POWER IN LESS SPACE...

Marshall, Michigan increases plant efficiency with

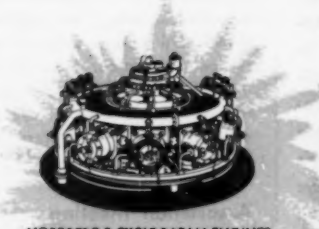
NORDBERG *Radial* DIESEL

When the City of Marshall, Michigan needed additional Diesel engine generator capacity without adding to existing plant floor space, careful study proved that the most efficient solution was the installation of a new Nordberg *Radial* Diesel Engine producing 1200 KW.

Here are some of the important reasons behind this selection of a Nordberg *Radial* Diesel: ☆ *Compact cylinder arrangement requires one-half of the floor and headroom space usually required.* ☆ *Well balanced, vibrationless engine permits simple, inexpensive foundation . . . down to 20% of normal requirements.* ☆ *Generator and accessories located below engine, in space ordinarily taken by large foundation (note illustration, above).* ☆ *Lower first cost—lower operating and maintenance cost.*

The Nordberg *Radial* Diesel is just one of the outstanding developments made by Nordberg in the internal combustion engine field. As builders of America's largest line of heavy duty Diesels, from 10 to over 10,000 hp in a single engine, Nordberg is well qualified to recommend exactly the right engine to meet your specific requirements.

Write for further details, outlining your power needs.



NORDBERG 2-CYCLE RADIAL ENGINES develop 1950 to 2125 hp, or 1250 to 1500 kw, at 400 rpm. Available as oil burning Diesels, as spark-fired gas burning engines, and as Duafuel® engines burning oil, gas or any combination of both.

Applicable for municipal and industrial power plants and central stations . . . wherever compact, economical, dependable power is required. *For full details, send for Bulletin.*

NORDBERG MFG. CO.
Milwaukee, Wisconsin

9752

NORDBERG
DIESEL ENGINES

Two Cummins Promotions

E. G. Ellis J. L. Peeler

Two Cummins Sales & Service, Inc. executive promotions were announced recently by Ken W. Davis, president of Cummins Sales & Service, Inc. E. G. Ellis has been promoted from general service manager to vice-president—maintenance and engineering, and J. L. Peeler, formerly assistant purchasing agent at Fort Worth, Texas, appointed to director of purchases at the same location. Mr. Ellis' sales and service experience include work as export service manager with Mid-Continent Cummins Export Corporation in New York City, mechanic for Cummins Sales & Service, Inc. at Odessa, Texas, and service manager for the organization at Houston, Texas. A native of Cleveland, Ohio, Mr. Ellis attended school at Cleveland. Before coming to work for the Cummins Sales & Service agency, Ellis was employed by two bus companies, a steamship company and a construction company.

Mr. Peeler is a native of Fort Worth, Texas and attended school in that city. He was employed by a supply company before starting with Cummins Sales & Service, Inc. In 1935, Mr. Peeler began working for Mid-Continent Supply Company. His service with them includes store manager at both Odessa and Seagraves, Texas, and diesel department manager at Fort Worth. Peeler has been with Cummins Sales & Service, Inc. since its organization in 1946.

Eatonite-Faced, Sodium-Cooled Valves

Specified where unquestionable dependability in heavy duty service is a first requirement

Eaton Sodium-Cooled Valves faced with Eatonite combine two major advantages: (1) reduced operating temperatures through internal cooling, and (2) high resistance to wear, corrosion, and heat through the application of Eatonite to the valve face. An important factor in the outstanding performance records being set by Eatonite-faced valves is the homogeneous structure produced by the exclusive Eaton process used in applying the hard-facing material. The result is long life and dependability in heavy duty service. Eaton Sodium-Cooled, Eatonite-Faced Valves are being used in the Packard Diesels now in production for the U.S. Navy.

EATON MANUFACTURING COMPANY
General Offices: CLEVELAND, OHIO
VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valves Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springlites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Descriptive Folder

The Columbia Electric Manufacturing Co., of 4519 Hamilton Ave. N.E., Cleveland 14, Ohio, has made available a new descriptive folder on the type AC-1 Columbia Volt-Ammeter. This new instrument is a clamp-type, hand size instrument for use on alternating current, that measures up to 600 amperes and 600 volts. It is equipped with ranges 0-12, 0-60, 0-120 and 0-600 amperes, 0-150 and 0-600 volts. The instrument is easily held and operated with one hand, weighing less than two pounds. It is reasonably priced and comes complete with voltage leads and carrying case.

New District Office

Roger L. Gilliland

The Swartwout Company announces the opening of a new district sales and service office for the Power Plant and Autronic Control Divisions at 317 West Main Street, Alhambra, California. The office, which will service southern California, Arizona and Clark County, Nevada, will be managed by Roger L. Gilliland. Mr. Gilliland, a graduate of the Case Institute of Technology, Cleveland, has been with the Swartwout Company for the past 10 years in the capacity of development engineer specializing in controller design and applications. Charles P. Crowley wil continue to handle special power plant equipment accounts from 711 Gibbons St., Los Angeles 31, while agents for the company's Industrial Ventilating Division, Gil Moore & Co., will maintain offices at 714 West Olympic Boulevard, Los Angeles 5.

Association Meeting

The Locomotive Maintenance Officers' Association 1952 annual meeting will take place September 15 through 17 at the Hotel Sherman in Chicago, Illinois. The three day meeting will include a series of reports on the various phases of locomotive maintenance. The sessions will be opened by Mr. W. J. Patterson of the Interstate Commerce Commission and will feature a special address by Mr. E. H. Davidson, director of the Bureau of Locomotive Inspection. The principal speaker will be Mr. J. P. Kiley, president of the Chicago, Milwaukee, St. Paul & Pacific Railroad.

Buehler ANNOUNCES

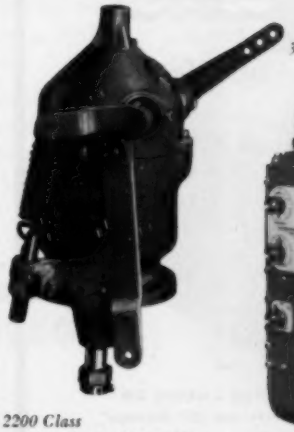
the purchase of

THE PICKERING GOVERNOR CO.

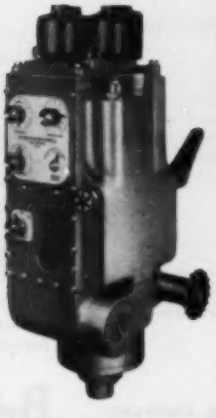
Buehler, Inc., manufacturers of automatic machinery and precision instruments for many years, has acquired all of the assets of The Pickering Governor Co., and is now actively producing the full line of Pickering hydraulic and mechanical types of governors.

The production and further development of engine speed governors constitutes the principal activity of the new owners. The Company is now ready to render prompt and efficient service.

A competent engineering staff is available. For consultation on your governor problems, write The Pickering Governor Co., Paramus, New Jersey.



2200 Class Mechanical Governor



3700 Class Hydraulic Governor

2600 Class Mechanical Governor

3200 Class Hydraulic Governor

THE PICKERING GOVERNOR CO.

ESTABLISHED 1944

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Cooling Tower Bulletin

The Water Cooling Division of the Binks Manufacturing Company, Chicago, announces publication of a new 8-page bulletin: Bulletin No. 47-A, describing the following mechanical draft cooling towers: Type 2-B, single inlet squirrel cage blower type (capacity range, 3 to 30 tons of refrigeration); Type 2-BB, double inlet squirrel cage blower type (capacity range, 32 to 60 tons of refrigeration); Type 3-D, horizontal induced draft fan-type (capacity range, 1 to 100 tons of refrigeration). The greater part of the bulletin is devoted to the Type 2-B and the Type 2-BB series. The sections dealing with those types each contain the following informative data: 1. A chart showing "typical temperature data." 2. Complete specifications on the tower. 3. A cut-away blue print of the tower and a "selection table for air-conditioning and related applications."

The page covering the Type 3-D tower has a detailed chart showing such items as dimensions, weights, and capacities for the various standard models of Type 3-D cooling towers. The bulletin lists 9 advantages claimed by the manufacturer for the Type 2-B and Type 2-BB series. Some of these are extremely quiet operation, simple installation, controlled air movement for correct air-to-water ratio and easy maintenance. The manufacturers also state that Type 2-B and Type 2-BB cooling towers are recommended for all installations in their capacity range where quiet operation is important. This advantage is becoming more and more essential with the widespread adoption of air conditioning machinery and related equipment in hospitals, private homes, hotels, apartment buildings, business establishments, public institutions, and other locations where excessive operating noise cannot be tolerated. Copies of Bulletin 47-A will be mailed to readers of this magazine without obligation. Address: Binks Manufacturing Company, Water Cooling Division, 3122 Carroll Ave., Chicago 12, Illinois.

. . . because they keep the lube oil clean— physically and chemically

THE GRACE MORAN

The "GRACE MORAN," other Moran tugs and many other vessels, power plants, railroads and transport lines have proved over the years that Briggs Oil Clarifiers improve engine performance by keeping lube oil clean.

BRIGGS offers the RIGHT FILTER for every diesel engine.

PROVE IT YOURSELF

Send us a sample of your oil and engine specifications. We will gladly make a laboratory test and give you our engineers' recommendation—no obligation, of course.

A Briggs Catalog belongs in your file—write for one NOW!

THE BRIGGS FILTRATION COMPANY
RIVER ROAD, WASHINGTON 16, D. C.

BRIGGS CLARIFIER—MODEL CD
(Filter, Strainers and Oil Storage Tank—in one unit)

Briggs
PIONEERS IN MODERN OIL FILTRATION

FOR MORE THAN A QUARTER CENTURY

Retires From Active Duty

Paul Diserens

After forty-three years of continuous service, Paul Diserens, director of Research and Development of Worthington Corporation and its subsidiary companies, is retiring from his former responsibilities, according to E. J. Schwanhausser, executive vice president. Mr. Diserens will continue with the corporation in a technical consulting capacity in engineering and research. Mr. Diserens joined Worthington (then known as the International Steam Pump Company) in 1909, where he was placed in charge of research testing at the Laidlaw Dunn Gordon Plant in Cincinnati. Here he contributed substantially to the establishment of engineering research as a basis for progress and development in power plant engineering. His early development of the now famous Worthington Feather-valve and variable capacity control for compressors are a portion of his achievements which helped place Worthington among the pioneers in engineering research as it is known today.

After progressing successively to chief consulting engineer, and later director of research of the company then known as Worthington Pump and Machinery Corporation, located in New York City, in 1944 he was made director of Research and Development of Worthington and its subsidiaries, with headquarters at Harrison, N. J. Receiving his B.S. at Purdue University in 1904, Mr. Diserens started his career as a research assistant associated with Dr. W. F. M. Goss and the Carnegie Institute of Washington, on superheated steam locomotive studies. He received an M.E. degree in 1906 at Purdue; and later, as an assistant in the University of Illinois Experimental Laboratories, was engaged in research on fuel combustion processes. Besides being a Fellow of the American Society of Mechanical Engineers, Mr. Diserens is a member o fthe American Society of Refrigerating Engineers and the U.S. National Committee of the Commission. During the war he served as a consultant for the National Defense Research Committee, later the O.S.R.D.

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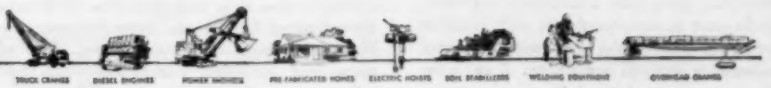


BATTERY CAPACITY CURVES

By K. A. VAUGHAN

WHEN properly used, a battery capacity curve can tell how many and what size batteries will supply a given power requirement. By using battery capacity curves, a user can check supplier's recommendations and be doubly sure not to choose under-capacity batteries that run down too soon or over-capacity batteries that call for unwarranted initial cost. Battery capacity, the total amount of energy a battery delivers as its voltage drops from initial to final value, depends on the temperature of the electrolyte and the rate at which the battery is discharged. Discharge rate is measured by the number of hours required to discharge the battery at constant current. Capacity is measured either by the ampere-hours a battery will deliver between charges or by the current in amperes it will deliver while being discharged. Batteries do not actually discharge all of the energy they store, but are considered to be discharged when their voltage reaches an arbitrary final value, usually taken as 1.75 volts per cell.

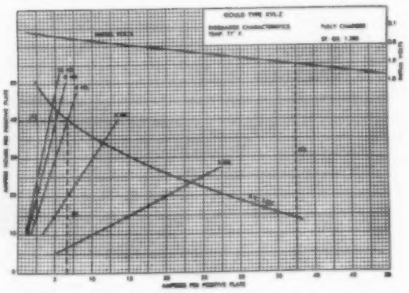
A capacity curve is the plot of the capacity per positive plate versus the ampere discharge rate for a given temperature and to a specified final voltage see illustration). This curve is drawn for final voltage (F.V.) of 1.75 volts and for an operating temperature of 77 deg. F. Hour discharge rates are represented by straight lines through the origin intersecting the curve marked F.V. To find the capacity per plate for a particular battery, select an hour discharge rate and find the intersection of the appropriate hour discharge-rate line with the curve marked F.V. on the capacity graph for that battery. The horizontal line through this intersection crosses the vertical axis at the ampere-hour capacity per positive plate and the vertical line through the intersection crosses the horizontal axis at the ampere capacity per positive plate.

As an example, suppose that batteries of Gould Type XVL-Z are to be discharged at the six-hour rate. Using the graph, the appropriate capacity curve for this battery, find the intersection of the six-hour discharge-rate line with the final voltage curve. Following the horizontal line "A" and the vertical line "B" shows the ampere-hour capacity to be 40 ampere hours per positive plate and the ampere capacity to be 6.7 amperes per positive plate. Current and duration of discharge determine the ampere-hour capacity by the formula: Ampere-Hour Capacity = (current in amperes) × (hours of discharge.) For greater accuracy, read the larger of these values and convert to the other with this formula. In our examples we can read 40 ampere-hours from line "A," then divide by 6 hours to set the ampere capacity of 6⅔ amperes. The following values were obtained from the graph by the procedure outlined above:

CAPACITY PER POSITIVE PLATE AT 77 F. TO A 1.75 F. V.

Hour Discharge Rate	Ampere-Hours	Amperes
10 Hr.	44.0	4.40
8 Hr.	42.5	5.31
6 Hr.	40.0	6.66
3 Hr.	34.0	11.33
1 Hr.	23.4	23.40

The values listed in the table are per positive plate. To find the capacity for the cell, multiply by the number of positive plates in the cell. By using these user can tell which battery described by the curves and similar data for other battery-types, the battery



is the size he needs and how many of these batteries will do the job. Capacity curves for various final voltages (in addition to the 1.75 volt curve shown here) and tables similar to the one above are prepared for each industrial battery and are available from manufacturers. In selecting batteries, the ampere-hour capacity requirement for each plant operating shift should be considered as 80 per cent of the actual requirement. Thus, ample surplus is assured for future additional needs. The initial voltage depends on the rate of discharge and can be determined by following the vertical ampere line to the initial voltage line at the top of the graph and then reading the initial voltage from the scale on the right. For example, the initial voltage at a discharge rate of 35 amperes per positive plate is 1.90 volts per cell, as was determined by following the line "C" up from 37.5 amperes to the initial voltage line. The following values were determined from the curve:

INITIAL VOLTAGE PER CELL AT VARIOUS DISCHARGE RATES

Hours	Amperes	I. V.
10	4.50	2.061
8	5.31	2.059
6	6.66	2.050
3	11.33	2.023
1	23.40	1.967

*Supervisor Field Engineering, Gould-National Batteries, Inc., Trenton 7, N. J.

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For all engines with HYDRAULIC Reverse Gears.
Patented

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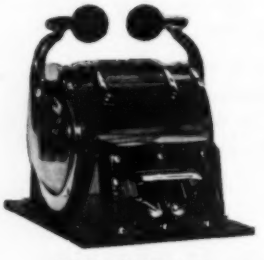

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Women ARE voting—AND helping to get-out-the-vote in so many ways—like writing chain-letter registration reminders . . .

and baby-sitting so their friends and neighbors can get out to register and vote . . .

who says

women aren't doing anything about voting?

Men just love to pass the ladies the blame for some of our low voting records in the past. But they'd better stop!

The percent of women voting in national elections has increased greatly since 1920 when women were first permitted to vote.

But that's only part of the proof! More and more women are working to help get out the vote this election.

Read the five ways shown here to get others to vote. But of course the way to start is in your own home and over your own back fence.

and giving "Birthright Parties" in Clubs and churches to welcome new voters just turned 21 and give them voting information they need . . .

and arranging and speaking at community meetings to make sure the vote on Nov. 4 is not only the biggest, *but the* best informed *in years . . .*

and organizing "car pools" to take voters to the polls for registration and to vote Nov. 4 . . .

To Display at Mining Show

Friction and fluid drives used throughout the mining industry to put machines to work more efficiently, will be displayed at the annual Mining Show of the American Mining Congress in Denver, September 22 to 25, by the Twin Disc Clutch Company, Racine, Wisconsin, and Rockford, Illinois. Highlight of the display, in booth No. 628, will be the Twin Disc truck type hydraulic torque converters. A motor driven clear plastic model of the converter will demonstrate how the Twin Disc three-stage design builds up high torque output (up to 6-to-1,) and how the valve-actuated or automatic-braking features function to combine with engine compression and friction to perform up to 90% of braking in mine hauling. An actual torque converter also will be displayed alongside the plastic model, along with a cutaway of the free-wheel assembly which engages the downhill braking in the automatic braking model.

Friction drives extensively used in mining, such as the Twin Disc Power Take-Off, heavy duty clutches and dry and oil-type multiple disc clutches, also will be displayed. Photographic transparencies of Twin Disc-equipped mining machinery and power-flow cutaways of torque converters and couplings will form the background of the booth. Engineering personnel of Twin Disc will be available throughout the show to describe various applications of Twin Disc drives, with the aid of Vu-Graph slides. Literature on the various products will be available, including Bulletin 501 describing the Truck Type Hydraulic Torque Converters.

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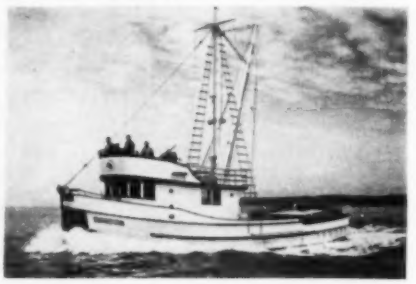
New Purse Seiner



Ready for fishing in Pacific Northwest and Southeastern Alaska waters this summer is the new purse seiner, *Guardian*, owned by Robert D. Rome of Everett, Washington. The craft is of wood construction just under 50-ft. in length on the keel. It has a beam of 16-ft. 4-in., a draft of 7-ft. and an estimated payload capacity of 15,000 sockeye salmon. She was designed by Edwin Monk and built by Riverside Boat Works at Everett. Powered by a 6-110 General Motors diesel engine turning a 54x45 Coolidge propeller the craft has a cruising speed of 9.6 knots at 1400 engine rpm. Although the home port of the vessel will be at Everett, drag fishing operations will be chiefly out of Astoria, Oregon and Ketchikan, Alaska and purse seining will be over the Point Roberts banks.

New Home

During July Commercial Filters Corporation, manufacturers of FULFLO Filters for the miscroscopic clarification of industrial liquids and gases, moved from Boston to its new factory in Melrose, Massachusetts. In every aspect the new plant has been carefully planned to provide every advantage afforded by the most recently developed types of construction and equipment. Located midway between Malden and Melrose the new plant has a long partly covered loading platform with large macadamized truck and trailer maneuvering area and spur track to Portland Division of the Boston & Maine Railroad, and is ideally located for receiving raw materials and shipping finished products. Macadamized parking lots with two-entrance driveways provide off-street facilities for employees and visitors. There is ample acreage for recreation and future expansion. The property faces a wooded park area and is flanked by residential areas.

The plant consists of three buildings with total area of 135,000 feet. The main building provides a large garage for company cars and trucks. All buildings are of fireproof construction and fully provided with the most modern fire protective equipment. Special features include: glass-block side walls; perimeter hot water heat and radiant heat floor panels in manufacturing areas; automatically controlled forced air winter heating and summer cooling and fluorescent lighting. Manufacturing areas used for processing cotton have controlled humidity.

16MM Film

A press preview of "The Alco Products Story," a new industrial movie based on the development and manufacture of products for the oil, chemical and power industries, was held recently in New York City by the American Locomotive Company. The 15-minute, 16mm, black-and-white film was produced by the company for its Alco Products Division, with plant and headquarters at Dunkirk, N. Y. The division builds heat exchangers, air coolers, pre-fabricated pipe and other equipment for many industries. It also has substantial defense orders. The film demonstrates engineering and production teamwork in all stages of manufacture. It describes how products are developed and how facilities, machines and manpower are coordinated for efficient output. One illustration of this is a sequence on the development of new manufacturing techniques used in the production of nickel-plated pipe for the Atomic Energy Commission. Prints of the film will be available to business groups and professional engineering societies on request at any of these offices or from Public Relations Department, American Locomotive Company, Schenectady 5, New York.

Four Plant Promotions

Four men received promotions in the Buffalo plant of Worthington Corporation according to an announcement by George Steven, executive engineer of that plant. The four promotions are as follows: Harold W. Whiting has been appointed assistant to the executive engineer. W. A. Scheerer has been appointed chief engineer—compressor division. W. J. Blessing has been appointed consulting engineer. Wm. K. Kaufman has been appointed chief engineer—engine division. Mr. Whiting attended Case Institute of Technology and after working for ten years with machinery companies in Cleveland and Erie, joined Worthington in 1939 as an engineer in the compressor division. He is vice chairman of the Buffalo section of the American Society of Mechanical Engineers; section director of the Buffalo American Society of Refrigeration Engineers; and a member of the American Society of Naval Engineers and the Technical Societies Council of Buffalo.

Mr. Scheerer was graduated from Ohio Mechanics Institute and the University of Cincinnati. He joined Worthington in 1929 as a draftsman in the compressor division at the company's Cincinnati plant. He is a member of the Professional Engineering Society of Erie County. Mr. Blessing has been with Worthington since 1905 and has served successively as draftsman, designer, chief draftsman and in 1929 as assistant chief engineer. He taught machine design in Buffalo Technical School from 1910 to 1920 and is now chairman of the Mechanical Technological Advisory Committee of Buffalo State Technical Institute. He is a member of the N. Y. State Society of Professional Engineers. Mr. Kauffmann was graduated from the Illinois Institute of Technology in 1926 with a B.S.M.E. degree. He joined Worthington in 1932 as a research engineer. He is a member of American Society of Mechanical Engineers; N. Y. Society of Professional Engineers and Sigma Alpha Epsilon.

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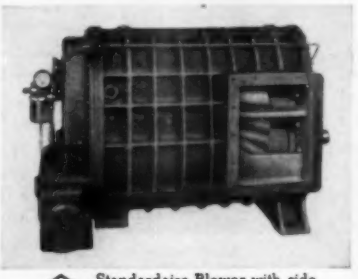
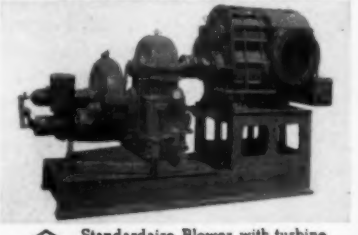


Standardaire Blower with side intake and discharge.

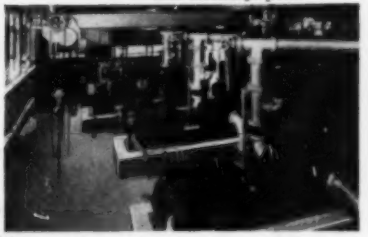


Standardaire Blower with turbine and gear drive unit.

Standardaire Blower with side intake and end discharge.

To meet the specific needs for industry, Standardaire's unique design provides for maximum flexibility in meeting unusual requirements for intake and discharge connections. For example, the blower intake or discharge ports can be located on the end, top, bottom or sides···· two intake or discharge ports may also be provided when necessary. These exclusive features, plus provisions for direct drive by a power unit of your choice, are typical examples of Standardaire's adaptability.

Standardaire Blower with single top intake and two side discharge ports.



Installation showing three Standardaire Blowers.

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Tugboat "La Dene"

One of the best tugboats owned by the Vancouver Tug Boat Co., Vancouver, B.C., is the tug *La Dene*, a completely remodeled former U. S. Navy personnel tug. It is 105 feet long, 22.6 feet across the beam, has a draft of 12.5 feet and is powered by a National Supply Co., 400-horsepower Atlas diesel. The conversion work, done in the Vancouver Shipyards, consisted mainly of reinforcing the transom stern, replacing the bulwarks and timbers and sheathing the hull with gumwood. The master's and mate's rooms are on the upper deck while the remaining eating and sleeping accomodations are on the boat deck. The *La Dene* is employed chiefly in towing barges between Vancouver and upcoast pulp and paper mills.

New Office

George J. Greaney, Jr., has opened up a new office for the Elliott Company at 731 Wilson Building, Corpus Christi, Texas. The Elliott Company, which has headquarters at Jeannette, Pa., and sizable plants there and at Ridgeway, Pa., Ampere, N. J., and two other locations, manufactures power plant, electrical and industrial equipment and has been doing business in this territory for many years. Mr. Greaney for the past four years has been a field engineer in Elliott Company's Houston office. Mr. Greaney was born in Galveston, graduated as an electrical engineer from Texas A & M, and went to work for the Elliott Company right after graduation in 1947. His college career was interrupted with a 3½-year tour of duty in the army, from which he emerged as captain in the U. S. Signal Corps. Mr. Greaney was assigned to the Houston office in July 1948.

Western Canadian Representative

S. C. "Sandy" McComb

Appointment of S. C. "Sandy" McComb as western Canadian representative, Heavy Machinery Division, headquarters in Vancouver, B.C., is announced by R. W. Bayerlein, vice president, Heavy Machinery Division, Nordberg Manufacturing Company, Milwaukee 1, Wisconsin. Born in Cardiff, Great Britain, where he received his early schooling, Mr. McComb entered Cardiff Technical College in 1919. Following five years of training, during which time he served his apprenticeship with Mount Stuart and Sherman Shipbuilding Company, Bristol Channel, he graduated with a diploma in Marine Engineering. He subsequently was associated with Standard Transportation of Hong Kong, The China Navigation Company, Malcolm & Company of Shanghai, Hong Kong and Singapore, the Macaau Water Development Scheme in South China and was called to active duty in the Royal Naval Reserve in 1939. Following his discharge from the Royal Canadian Navy, he returned to Canada and began the business partnership of Judson, McComb & Worrell in Vancouver. He retained this association until 1948 when he joined Simplex Engine Company as sales manager. In 1950, he was employed by A. R. Williams Machinery Company and placed in charge of diesel and gasoline marine engine sales.

San Francisco Representative

Eugene D. Sweetland

Eugene D. Sweetland, head of E. D. Sweetland Company, technical sales engineers, and son of the late Ernest J. Sweetland, who invented the *extended area* filtering principle with which Purolator Products, Inc. founded the automotive filter industry 30 years ago, has been appointed industrial representative for Purolator in San Francisco and the Bay Area, Carlos D. Kelly, vice-president of Purolator announced recently. Mr. Sweetland, who is associated with Irving Siminoff, in design, sales and installation of hydraulic and filtration equipment for industrial purposes, has his offices in the San Francisco Bank building, 405 Montgomery Street. His firm will specialize entirely in the industrial field and wall not service automobile accounts.

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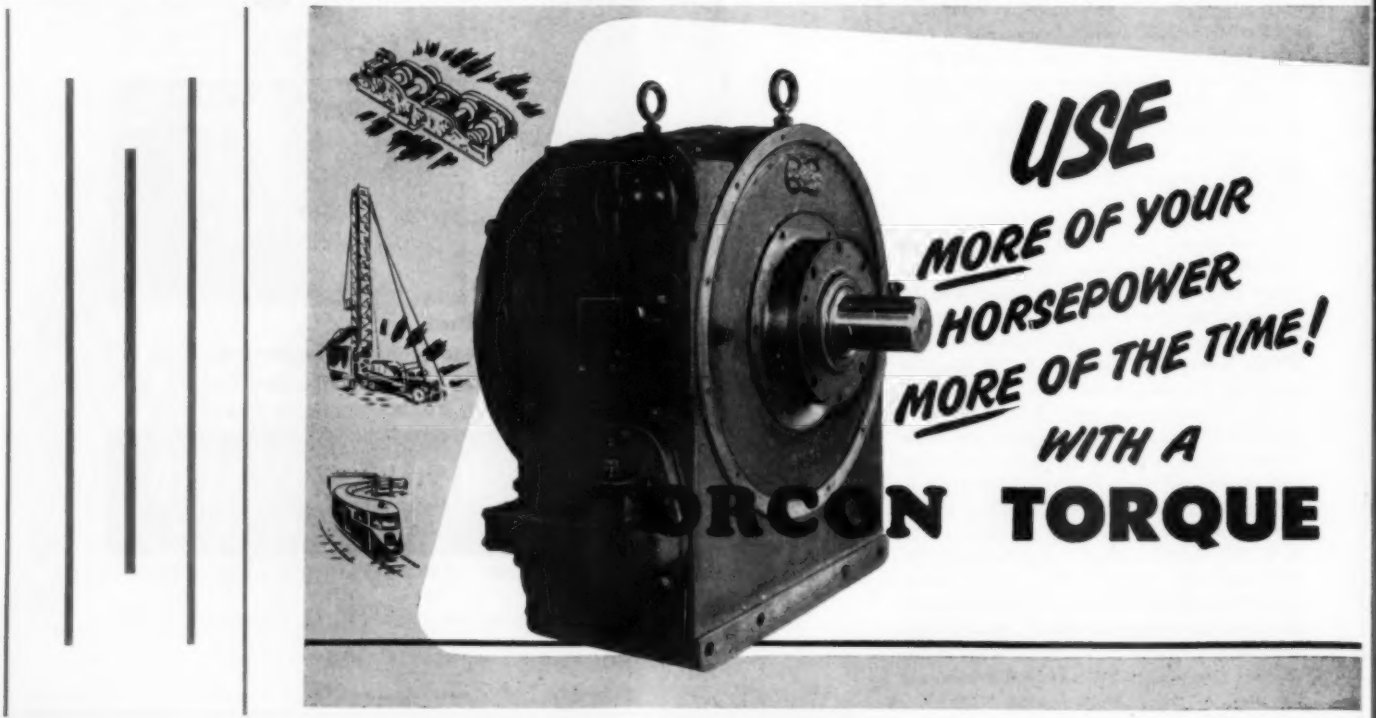

THE PHOSPHATE RUN

By E. F. DENNIS

Cummins Diesel Engine Co. of Florida has recently repowered a 65 ton Whitcomb switching locomotive at the phosphate plant of the Plant Food and Chemical Division of the Virginia-Carolina Chemical Co., in Nichels, Florida.

The repowered locomotive is equipped with two model LRI 600 Cummins diesel engines each rated at 300 hp. at 1050 rpm., or a total of 600 hp. for the locomotive; this is an increase of approximately 20 per cent over the old installation. The six weeks test conducted under the watchful eyes of Eric Erickson, the Cummins engineer, and H. L. Clark, the railroad shop superintendent, was so successful that another locomotive will be repowered in the near future.

The tests also revealed that while the power available had been increased, the percentage of available power used, by the locomotive, had been decreased and because of this increase of horsepower available the locomotive will be able to carry more loads if needed. This also will lower the maintenance costs as the diesels will not be operated at their peak capacity except in emergencies. Other equipment used and improvements made were a Thomas Flexible coupling between each of the Cummins diesels and the model 197A Westinghouse locomotive generator; a variable speed Woodward model SG 8 hydraulic governor; Nugent strainers for both the fuel oil and lubricating oil systems. All the electrical equipment is made by Westinghouse.

The 65 ton Whitcomb Cummins diesel locomotive backing a phosphate train into the drying bins.

One of the new Cummins diesels

The Thomas Flexible coupling between the diesel engine and the Westinghouse generator.

Operators of shovels . . . draglines . . . cranes . . . rail cars . . . lift trucks . . . road machinery . . . tractors . . . mining machinery . . . logging equipment . . . oil well rigs are discovering the advantages of **TORCON TORQUE CONVERTERS.** This automatic hydraulic transmission features variable speed and torque ratios, and facilitates the full utilization of your power source throughout the entire range of operation.

TORCON CONVERTERS are available for applications involving horsepowers from 30 to 600. They can be furnished with and without cut-off clutches.

TORCON units assure *maximum utilization of horsepower,* provide for *more production at less cost, eliminate shock to powered equipment, reduce operator fatigue* and *increase* the *service life* of your machinery.

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USE MORE OF YOUR HORSEPOWER MORE OF THE TIME

New York Sales Engineer

Otto G. Wenzel

Appointment of Otto G. Wenzel as sales engineer in the New York office of the Heavy Machinery Division is announced by R. W. Bayerlein, vice president, Heavy Machinery Division, Nordberg Manufacturing Company, Milwaukee 1, Wisconsin. Mr. Wenzel was formerly eastern sales manager of the Diesel Engine Division of Baldwin-Lima-Hamilton Corporation. A native of Ohio, Mr. Wenzel received his formal education in this state and graduated from Xavier University in Cincinnati. Following several years in business and in the electrical generating field, he joined General Machinery Company in 1935 and was assigned to the diesel engine erection floor. From 1937 to 1940 as service engineer he supervised the installation, tests and trials of marine diesel engines on U. S. navy submarines. In 1940 he took a year's leave of absence from General Machinery and was assigned to the U. S. Navy as civilian technician training Navy personnel in operation of submarine diesel engines. Mr. Wenzel returned to active status with General Machinery in 1941 as service engineer handling installation of diesel engines in Navy Patrol Craft and a short time later was placed in charge of all diesel engine service. He returned to the ocmpany's Hamilton, Ohio plant in late 1944 when he was named works manager, Diesel Engine Division. With the merger of General Machinery with Lima Locomotive Works in 1947, Mr. Wenzel was named sales manager of the company's New York office and took charge of diesel engine sales, both stationary and marine. He retained this position until coming to Nordberg.

New Workboat

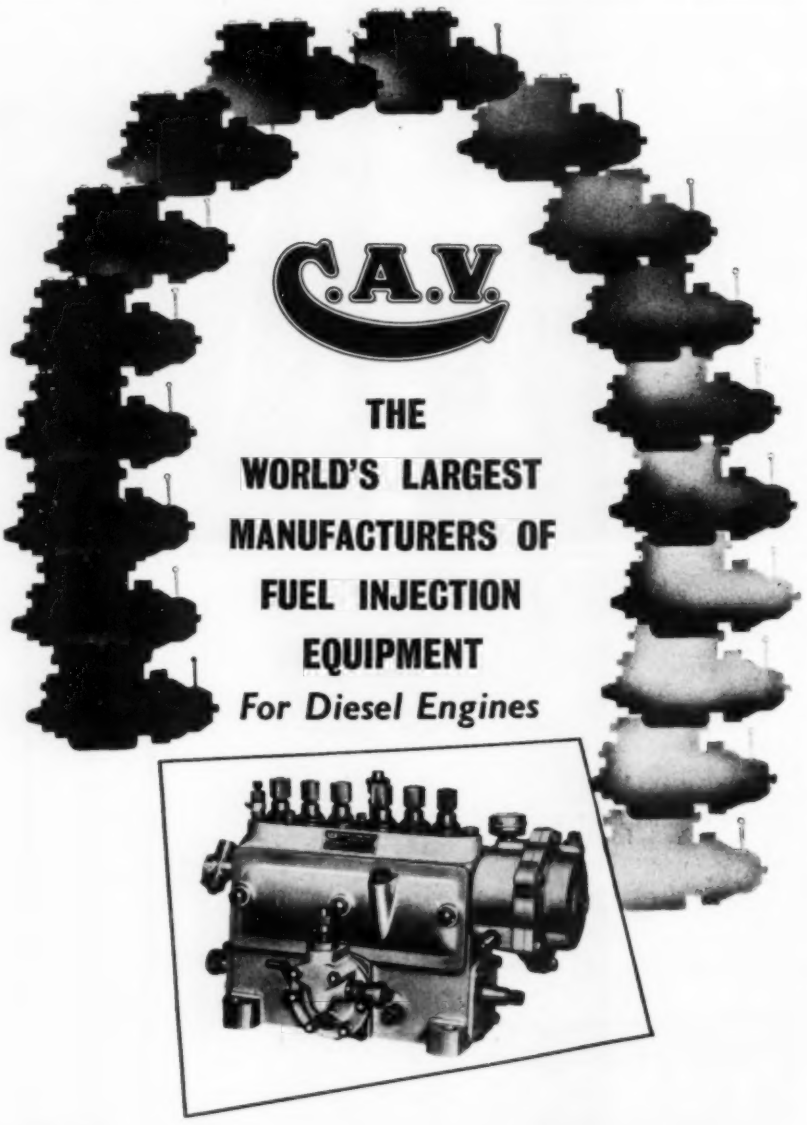
The Mid-South Equipment Company reports that they are more than satisfied with their new twin screw towboat, *Lulubelle II*. Recently built by the St. Louis Shipbuilding & Steel Co., the vessel is in the sand and gravel service around Memphis. Rivermen are watching this boat with considerable interest since it is one of the first river installations of Cummins Model NHMRS-600 diesel engines. The hull is 48 x 14 x 6 feet with normal draft of 3 ft. 10 in. The side and bottom plating is 5/16 in. with deck and bulkheads ¼ in. The bow is a modified scow type while the stern has two well rounded tunnels. The deckhouse is 10 gauge steel throughout with steel sash and steel doors.

The two Cummins NHMRS-600 diesels are six cylinder, 5½ in. bore by 6 in. stroke and develop 190 hp. each at 1800 rpm. They are fitted with 3 to 1 ratio reverse-reduction gears with the propellers turning at 600 rpm. The engines are completely controlled from the pilot house and are started by air. The jacket water is cooled in a modified St. Louis Shipbuilding & Steel Co. skin cooling system. The electric power is supplied by a 6 kw. Witte, model LDTED diesel electric unit furnishing 115 volt dc. power. The boat has two steering rudders and three backing rudders operated by a combination manual and hydraulic booster system.

Caterpillar Director

Robert Watt Miller

Election of Robert Watt Miller as a director of Caterpillar Tractor Co., is announced by A. T. Brown, executive vice president of the Company. He will fill the vacancy created by the death of his father, C. O. G. Miller of San Francisco, Calif. Mr. Miller is a director of American Air Lines, Standard Oil Co. of California, J. A. Folger & Co., American Trust Co., Pacific Public Service Co., Pabco Products, Inc. and the Tucker Investment Co. He is president of the San Francisco Opera Association and a trustee of the California Institute of Technology and a member of the Pacific Union and Bohemian Clubs of the Bay Region, the California Club of Los Angeles, the Recess Club of New York and Burlingame Country Club.



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Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO

Manages Cincinnati District Office

R. J. Meinert's appointment as manager of Mack Motor Truck Corporation's Cincinnati District office is announced by A. F. Fenner, vice president and general sales manager. Since 1945 Mr. Meinert has been National Accounts manager for Mack's Central Division with offices located in Chicago. Prior to 1945 he had served the company in various capacities in Chicago, St. Louis and Kansas City. Mr. Meinert's association with Mack dates back to 1923. In his new position Mr. Meinert will direct Mack's truck, bus and fire apparatus sales and service activities in the Cincinnati area. He succeeds Ward N. Shaw, manager of the company's Cincinnati office since 1932, who has been transferred to Florida.

Speeds Operation

A two-cycle diesel engine recently installed on a Telesmith portable rock crusher is saving its owners over an hour's set-up time on each move to a new location. Howard Haferman of Haferman and Stark, sand and gravel contractors of Jordan, Minnesota, owners of the rig, said this was due to the compact size of the new engine which permitted its installation directly on the rig. The previous engine which was almost 50% greater in size and weight was mounted on a separate vehicle.

Mr. Haferman also pointed out that despite its compact size, the additional power of the new engine, a six-cylinder GM diesel, stepped up the rig's production some 20%. In the photo showing the new installation is Mr. Haferman and R. E. Murray, diesel engine manager of the Borchert-Ingersoll Company of St. Paul.

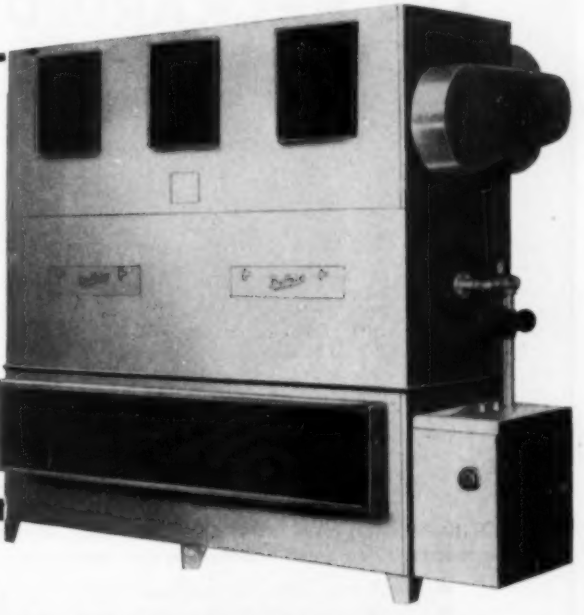
Dual-Purpose Preservative Oil

The internal combustion engine which is temporarily taken out of service for purposes of storage or shipment presents a special problem. It must be properly lubricated for service preceding or following the stand-by period, and it must be protected against rust and the acidic products of combustion while it is not being used. In the past it has been necessary to accommodate these separate needs with separate products. The lubricant was drained from the engine and a preservative put in, and vice versa, depending, of course, upon whether the engine was going in or out of service. Extensive research covering all aspects of this problem has resulted in the development of a new dual-purpose product by the Port Neches, Texas, Laboratories of The Texas Company. Produced in two grades, Texaco Preservative Oil 10, and 30, functions both as a lubricant and as a preservative. It eliminates the need for handling two products successively. The time which is saved is a critical consideration in the instance of military vehicles being shipped to an area where they may have to "come out fighting."

Texaco research experts carried out long-range investigations into such factors as humidity, condensation, corrosion, and related phenomena. The resultant product combines special additives developed to ensure maximum preservation of internal engine surfaces with motor oil additives of the type used in heavy duty lubricants. Texaco Preservative Oil 10, and 30, incorporate characteristics which in some instances exceed by five-fold the requirements of military specifications. For example, one test requires that steel panels, which have been dipped in preservative oil, should remain free of corrosion after 200 hours' exposure in a humidity cabinet at 100 degrees (F.) ad 95-100 per cent relative humidity. The new Texaco formulation gave protection for more than 1,000 hours. In addition to its application in the engines of vehicles scheduled for storage or shipment, the new lubricant-preservative has proved useful in other internal combustion engines in intermittent service. Examples of the latter are stationary engines and engines in farm vehicles. Texaco Preservative Oil 10, and 30, when functioning as a lubricant need not be changed until the engine has reached the normal drain-and-refill point. It is compatible with qualified heavy-duty motor oils.

"Buffalo" Tips On Better DIESEL COOLING

CAREFUL ENGINEERING means SATISFACTORY PERFORMANCE



"Buffalo" EVAPORATIVE COOLER

1. CLEAN, EFFICIENT COOLING in a closed system—keeps foreign matter out. Liquid to be cooled flows through spiral fin coils efficiently cooled by evaporation of fine spray on the surface of the coils.
2. WATER ECONOMY—only loss is through evaporation. Balance of spray water collects in tank at bottom of unit and is recirculated.
3. EASY INSTALLATION—sectional construction and compact size permits bringing the unit in through standard building openings and installing near equipment it serves. Big savings may be effected in this way. May be installed outdoors, if desired.
4. FREEDOM FROM TROUBLES—operation and maintenance are simple. "Buffalo" Pumps and non-clogging spray nozzles are trouble-free. Casing construction is sturdy and rigid. Here is an ideal unit for continuous, heavy-duty cooling of Diesel jacket water.

For further information, write for Bulletin 3666.

DIAMOND JUBILEE 75TH ANNIVERSARY

FIRST FOR FANS

BUFFALO FORGE COMPANY

536 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

EVAPORATIVE COOLERS AND AXIAL FLOW FANS FOR COOLING MOBILE AND STATIONARY DIESELS

Assistant Chief Engineer

Vernon L. Durrstein

Vernon L. Durrstein, special design engineer of the National Supply Co. Engine Division for the past eight years, has been appointed assistant chief engineer of that division, with headquarters at Springfield, Ohio. Mr. Durrstein graduated from the University of Illinois in 1931 with the degree of bachelor of science in mechanical engineering. Prior to joining The National Supply Co. he served as a design engineer with the Cummins Diesel Engine Co., Columbus, Ind., and as assistant chief engineer with the Buda Co., Harvey, Ill. He is a registered engineer in the State of Ohio and is an active member of the Society of Automotive Engineers.

Anderson-O'Brien Expands

The Anderson-O'Brien Company of Los Angeles has recently expanded to form the Salyers Equipments Company as a manufacturing unit in its scope of operations. The Salyers Equipment Company, located at 726 E. Washington Blvd. in Los Angeles, has gone extensively into the assembling of packaged Delco generator sets complete with engine unit and ready for operation when shipped to the purchaser. Salyers are equipped to install generator sets with all types of engine units and to make their own automatic controls for this purpose. A welding department and engine testing apparatus are added features of this new company. Units are now being completed for the Chief Joseph and Isabella Dams, and for the Hughes Aircraft Company.

Catalog

The Bunting Brass & Bronze Company of Toledo, Ohio has issued a profusely illustrated 72 page catalog. There are 854 different sizes of standard stock bearings listed and illustrated ranging from $\frac{3}{16}$-inch to 4½ inches inside diameter and the range of outside diameters to meet, without further finishing, practically all production and service needs of modern industrial machinery. There are also included in this catalog 324 different electric motor bearings, 263 sizes of tubular and solid bunting precision bronze bars, all available from stock through authorized industrial distributors. Copies of this catalog may be obtained from the Bunting Brass & Bronze Company, Toledo 1, Ohio. Ask for catalog fifty-two.

Diesel-Electric Rail Car Introduced

A new diesel-electric rail car, known as the Mack FCD rail bus which may solve the problem of handling light branchline service economically for many railroads, has made its debut on the New York, New Haven and Hartford Railroad. Designed and built by the Mack Manufacturing Corporation and equipped by General Electric, the new rail car operates on a 17-mile stretch between Mansfield, Taunton and Fall River, Mass. The new rail car is an adaptation of the 50-passenger Mack bus used in New York City. It has a power plant consisting of a Mack 220 hp. supercharged diesel engine directly connected to a GE generator which, in turn, drives four 55 hp. GE traction motors. The chassis is mounted on two four-wheel PCC car trucks with one motor driving each of the four axles.

Although no exact operating figures are available yet, New Haven officials believe the cost will be one-fourth that of present equipment. The car, which makes three rounds trips a day on each run, offers passenger service where none has been provided for the past 20 years. Since initiated, it has carried some 170 to 180 riders per day. Reactions of customers, which most pleased a New Haven official on the new car's recent initial run, were: One customer was so comfortable that he fell asleep and another was observed reading fine print with the magazine on his knee.

"AMOT" *is standard* ON PACKARD DIESELS

AMOT thermostats have offered the following advantages to Packard over all other makes of automatic cooling water temperature regulators:

1. Large capacity combined with light weight.
2. Excellent reliability even under extreme shocks and vibration.
3. No external bulbs or tubing to break and cause trouble.
4. Operating forces are very large and with no packing glands, there is no chance of valve ever sticking or becoming inoperative.
5. Holds close regulation and is not sensitive to pressure.
6. Temperature is fixed and cannot be tampered with.
7. Because of its simple and rugged construction, practically no maintenance is ever required.
8. Compact in size, and will operate in any position, which facilitates piping.
9. Has positive 3-way action.
10. Prices are competitive.

Write for the name of your nearest AMOT representative, who will be glad to go over the application of an AMOT thermostat for either jacket water or lubricating oil temperature control to any gas or diesel engine installation using up to 6″ piping. AMOT catalogs are available on request.

AMERICAN MOTORS CO. 21 Nevin Ave. Richmond 5, Cal.

Buehler Inc. Buys Pickering Governor

The sale of the Pickering Governor Company to Buehler Inc. was recently announced. Included in the transaction were all manufacturing rights, machinery, equipment, tools, dies, patterns, jigs, fixtures, etc. Also certain key personnel were transferred to the new owner. This business will continue to be conducted under the name of the Pickering Governor Company in the plant of the new owner, Buehler Inc., Route 17, Paramus, New Jersey, and Buehler Inc. will be the exclusive manufacturer of the complete line of Pickering governors.

Buehler Inc. states that the activities of the company will be under the general supervision and guidance of Mr. Emil Buehler, President, and since this business will henceforth constitute the principal product of the company, it will receive preference over everything else with attention particularly focused on the manufacture and further development of governors. Wherever necessary, re-tooling will be made to assure interchangeability of all parts and high standards of material and workmanship will be maintained. The aim of the new owner is to encourage the continued patronage of long-time Pickering Governor customers and to extend the use of these governors under the well-known Pickering slogan, "A Better Day's Work The World Over."

Advertising and Sales Promotion Manager

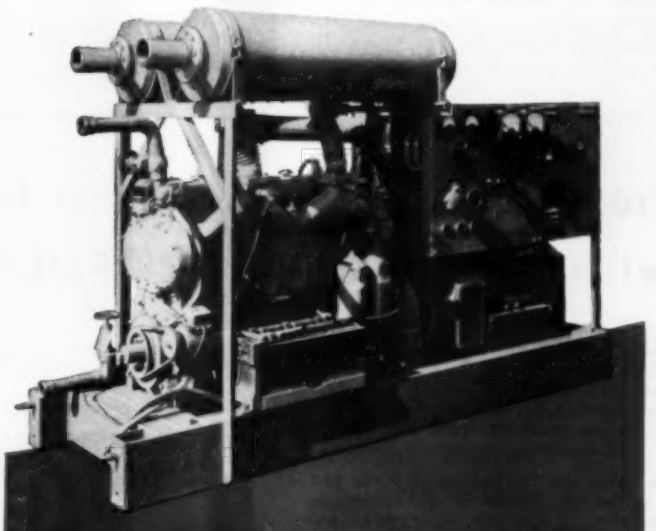
M. E. Ziegenhagen

M. E. Ziegenhagen has been named advertising and sales promotion manager of Worthington Corporation, Harrison, N. J. This announcement was made recently by T. J. Kehane, general sales manager and assistant vice president. Mr. Ziegenhagen has been associated with General Electric Corporation since his graduation from the University of North Dakota in 1937 where he was awarded a B.S. degree in Mechanical Engineering. After taking General Electric's student engineer course, he became sales promotion assistant in that company's Pittsfield, Mass., plant. In 1941 he became account supervisor at the Schenectady plant and from 1943 to 1945 was in the service of the U. S. Navy. Since 1946 he has been in charge of advertising and sales promotion for several of the product departments of General Electric's Schenectady plant.

Names Two to Sales Posts

George Gilliam and C. J. Smolinske have been named to industry sales managers' posts for the industrial division of the Minneapolis-Honeywell Regulator Company, it was announced by W. H. Steinkamp, general sales manager. Mr. Gilliam will be in charge of sales of the company's products for all types of engines and test facilities. Mr. Smolinske has been named industry sales manager for pyrometer supplies, a post formerly held by Gilliam. Both will headquarter in Philadelphia.

MAXIM SILENCERS*



GOOD PUBLIC RELATIONS FOR PORTABLE POWER ANYWHERE

* Two Maxim Exhaust Silencers shown on General Motors Diesel generator set built for portable power for "on location" movie making.

Consult MAXIM

THE MAXIM SILENCER COMPANY
94 Homestead Ave., Hartford 1, Conn. Dept. W.L.
Gentlemen:
Please send me your bulletin on Exhaust Silencer.
Name _____
Company _____
Address _____
_____

EMX52

On Standby Power Plants

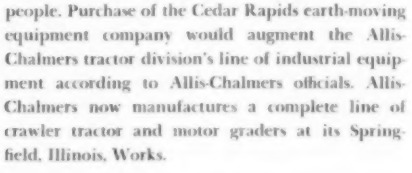
How a super service truck station continued to serve its many customers when a crippling storm cut power for six hours; how thousands of loaves of bread are prevented from spoiling if power for oven conveyors is cut off; how civil defense communications stations are protected—these and many other examples of how emergency standby power serves business and community life are contained in a 24-page, two-color magazine, Power Points, published by D. W. Onan & Sons Inc., Minneapolis 14, Minnesota. Illustrated with over sixty striking photos, the magazine gives a report of standby installations in hospitals, schools, government agencies. It points out how power failures, on the increase because of high prevalance of storms and floods, overloaded power lines and other causes, affect normal routine, and how standby power works to "save the day." This issue of Power Points is available upon request with the compliments of the manufacturer. Specify Volume 8, Number 2, when writing.

To Acquire LaPlant-Choate

Negotiations are underway for the acquisition of the LaPlant-Choate Manufacturing Company, Inc., Cedar Rapids, Iowa, by the Allis-Chalmers Manufacturing Company according to an announcement by A. D. Dennis, president of the Iowa firm. In a letter sent recently to stockholders of the LaPlant-Choate company, Dennis and Roy E. Choate, chairman of the Iowa firm's board of directors said that "direct negotiations are being conducted with the Allis-Chalmers Manufacturing Company of Milwaukee, Wisconsin." The letter said the negotiations were "looking toward the acquisition by Allis-Chalmers of the plant and assets of La Plant-Choate Manufacturing Company, Inc., or some arrangement for an exchange of stock, merger, or consolidation."

Allis-Chalmers officials in Milwaukee said the Iowa firm manufactures five sizes of earth-moving equipment. They said that seven buildings totaling 270,000 square feet and located on an 18-acre parcel of land, comprises the plant proper. The Iowa company normally employs between 800 and 900 people. Purchase of the Cedar Rapids earth-moving equipment company would augment the Allis-Chalmers tractor division's line of industrial equipment according to Allis-Chalmers officials. Allis-Chalmers now manufactures a complete line of crawler tractor and motor graders at its Springfield, Illinois, Works.

New Catalog



Parsons Company recently issued a colorful 4-page catalog describing outstanding features of the new Parsons Model 202 Trenchliner. This is a wheel-type digging unit, designed primarily for drainage and utility trenching work, with a maximum digging capacity of 18½ feet per minute, according to the manufacturer. Located in Newton, Iowa, Parsons is a subsidiary of the Koehring Company of Milwaukee. Full crawler mounted the Parsons 202 Trenchliner is equipped with either square or round bottom buckets that cut trenches 13 to 31 inches wide, to a maximum depth of 6 feet. Its range of 30 digging feeds extends from 6.2 inches to 18½ feet per minute. Bucket fronts can be changed quickly from cutting lips to Parsons "Tap-In" teeth to meet any soil condition.

Outstanding features incorporated in the new 202 Trenchliner for high speed production on drainage, irrigation, municipal and utility trenching projects include: enclosed friction clutches for accurate control of wheel depth to grade; all-welded unit frame and truck rollers mounted on anti-friction bearings; the shiftable and reversible belt conveyor that discharges soil to either side of the machine; enclosed main gears running in oil bath to assure dependable performance. A choice of either 52 hp. gasoline or 55 hp. diesel engines is offered with the Model 202. Copies of the new bulletin may be obtained from any Parsons distributor by writing direct to the Parsons Company at Newton, Iowa.

The easy way to power a hull is with OUTBOARD PROPULSION

YOU'LL find that Harbormaster Outboard Propulsion and Steering Units can readily be installed on most barges, scows, towboats, tugs, lighters, derricks, ferries, etc. . . . and will give you great savings in installation, operation and maintenance costs.

What's more, the Harbormaster gives you greatly increased flexibility of operation, rugged efficiency, plus the inherent advantages of outboard power. You get the ultimate in maneuverability and economy . . . steer instantly with full power in any direction through the M&T 360° patented method of Propeller Thrust Control, and save on fuel consumption because you have more thrust per horsepower.

Other important features of the Harbormaster include exclusive 180° Elevating Mechanism which allows 1-man operator to easily maintain and service the equipment; and Patented Shear Pin, which automatically shears off should underwater assembly strike a submerged obstacle . . . thus opening up vast new shallow water fields to continuous, reliable operation. Harbormaster models, for all marine purposes, are available in sizes from 20 to 300 h.p., gas or diesel power.

You'll find detailed data and valuable information in our comprehensive catalog containing over 70 photos and diagrams. Gladly sent you on request, whether you have immediate or future use for Harbormaster units. Why not write for the catalog now so that you will have full information.

Murray & Tregurtha
HARBORMASTER
Outboard Propulsion
And Steering Units

Murray & Tregurtha, Inc.
6 Hancock St., Quincy 71, Mas

Please send catalog, without obl , covering the HARBORMASTER Outboard ulsion And Steering Unit.

Name.....

Company.....

Address.....

Outboard Propulsion . . . Heavy Duty Power With Outboard Maneuverability

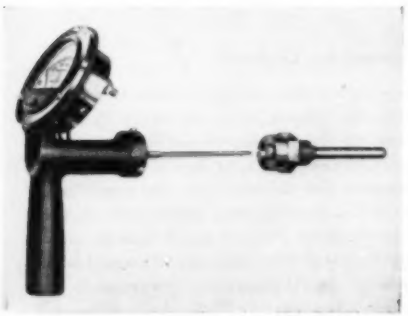
Relocating Highway

Approximately 475,000 yards of earth and rock is being moved by the Brown Construction Company of Pueblo, Colorado to improve and relocate parts of a five mile section of U. S. Highway No. 30 between Laramie and Cheyenne, Wyoming. Shown working on the project in Telephone Canyon is a Lorain 1 ¾-yard shovel powered by a General Motors 6-110 Diesel engine.

Warner Gear Elections

At the annual meeting of the Supervisory Board of the Warner Gear Division of Borg-Warner Corp., E. Swain Russey was elected president of Warner Gear to succeed A. P. Emmert, who retired from the active management of the division after 25 years of total service, including the last eight years as president. Four new vice-presidents were appointed from among the present departmental executives. The new vice-presidents, all of whom have been with the division for 20 years or more, are T. J. Ault, William H. Cortwright, John C. Oesterle, and Andrew W. Rose. The following officers of the Warner Gear Supervisory Board were elected to serve during the ensuing year: C. S. Davis, Chairman of the Board; A. P. Emmert, Vice Chairman; and J. C. Oesterle, Secretary.

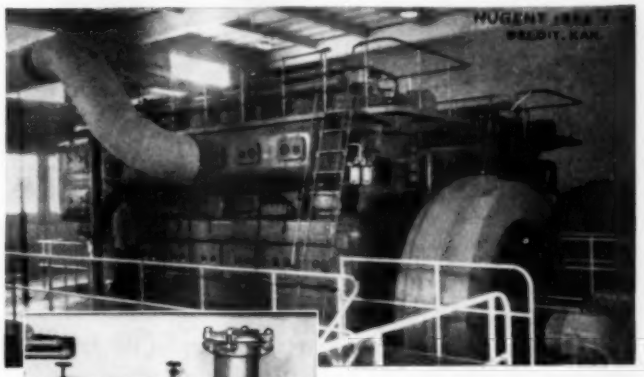
Portable Diesel Engine Pyrometer

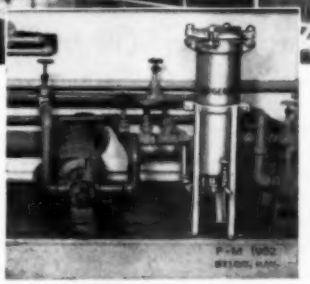


A new portable diesel engine pyrometer has just been announced by The Bristol Company, Waterbury 20, Conn. The new instrument is designed for test purposes and for installations where no permanently mounted pyrometer is available. The thermocouples can be installed in each cylinder and in the main exhaust line. Temperatures can then be checked at any time by inserting the pyrometer prongs into the corresponding receptacles in the terminal head of the thermocouple. The new pyrometer, Model 4-321, is described in Bristol Bulletin P1247, which is available on request.

Nugent Protection

for the new power plant at Beloit, Kansas





NUGENT Oil Filters help assure long, trouble-free engine service

IN any engine installation where so much depends on operating economy and continuity of service, only the most efficient oil filtering is truly economical. Nugent Filtering is economical—it removes 99.8% of dirt and other harmful impurities . . . it reduces neutralization number of lubricating oil from 0.40 to 0.04 . . . it absorbs moisture four times its own weight . . . recharging is simple, fast and inexpensive.

To get all the dependable service your diesel engines were built to give, change over to Nugent Filters now and for that new installation, specify Nugent Filtering from the start. Write today for descriptive literature giving full details on Nugent Filters for handling from 1 to 384,000 H.P.

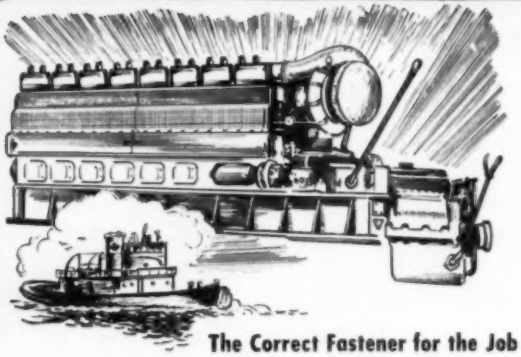
The photos above show the Nugent filters installed on the two 2100 H.P. Fairbanks-Morse Dual-Fuel Engines in service in the Beloit, Kansas, power and water plant.

Wm. W. Nugent & Co., Inc.
415 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TRIDICATOR ENGINE OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897

For DEPENDABILITY IN DIESEL ENGINES



The Correct Fastener for the Job

For over 38 years Erie has manufactured bolts and studs to the specifications of Diesel Engine builders. This specialized experience gained in working with leading Diesel designing engineers assures you of getting the exact materials and the precise tolerance in bolting desired for your Diesel. Send us your specifications for Diesel Connecting Rod Bolts, Cylinder Head Studs, and other special bolting.

A SUBSIDIARY OF Barium STEEL CORPORATION

ERIE BOLT and NUT CO.
ERIE • PENNSYLVANIA

STUDS • BOLTS • NUTS
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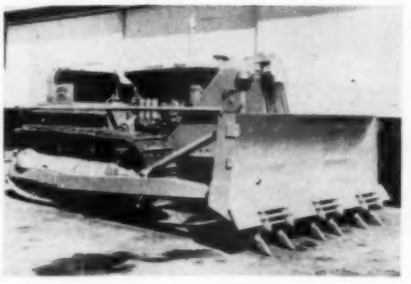
Representatives in Principal Cities.

Removable Rippers



A new, faster method for simultaneous blacktop removal and ground releveling is being used on the 160 acre job at Camp Beale, Marysville, California. Caterpillar dozer blades are equipped with Hensley Removable Rippers that rip blacktop loose and stack it in piles during the releveling operation. Stolte, Inc. and Gallagher-Burk Inc., contractors on this $5,500,000 job, anticipate substantial savings through the elimination of a separate scarifying operation. The tractor assembly photographed is equipped with the removable ripper teeth, D8 rollers ,and dozer cutting enge and end bits manufactured by Hensley Equipment Co., 878 Joaquin Ave., San Leandro, Calif.

Appoints New Chief Engineer

Richard E. Brown

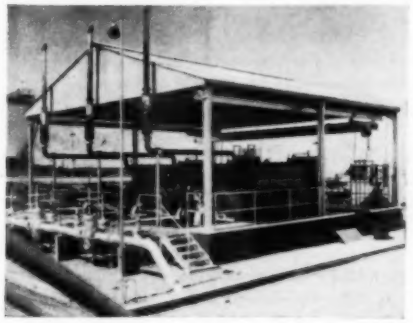
Appointment of Richard E. Brown as chief engineer has been announced by the Air-Maze Corporation, Cleveland, Ohio. Mr. Brown has been with Air-Maze during the past ten years as development engineer and more recently, assistant chief engineer. He graduated from Case Institute of Technology with a degree in mechanical engineering and is a member of the Society of Automotive Engineers and Beta Theta Pi fraternity.

Locomotives Ordered

Receipt of an order for forty General Motors locomotives for Pakistan is announced by Nelson C. Dezendorf, vice president of General Motors and general manager of Electro-Motive Division. The locomotives are for service on the meter gauge lines of East Pakistan often known as the Eastern Bengal Railway. This is distinct from the broad gauge railway of West Pakistan. "These will be the first diesel electric locomotives to operate in East Pakistan," Mr. Dezendorf pointed out. "They will be in service handling the 'life-line' traffic from the very important port of Chittagong."

These diesel electric locomotives are road locomotives designed for universal freight and passenger service particularly suitable for the light axle load requirements for meter gauge railway conditions. The locomotives are of a conventional design with AIA-AIA wheel arrangement. All of the locomotives will be powered by the General Motors Model 567 diesel engine of which over 16,000 have been built by Electro-Motive Division, mostly for locomotive application. Delivery of the initial units is scheduled for July, 1953.

Crude Oil Powers Booster Diesels



Boosting crude oil pressure in a Richfield Oil Corp. transmission pipeline running through the Cuayama Valley in California, is the job of three National Supply Co. Atlas diesels. Each of the three pumps, which are piped in series, is driven by a Model 45, 8-cylinder, 4-cycle engine using crude oil for fuel and developing 320 hp. at 600 rpm. The engines are connected to Byron Jackson centrifugal pumps through Pacific Western speed increasers. The speed increasers have 18 in. Falk flexible couplings on the engine side and Thomas couplings on the pump side. The complete engine pumping units are mounted on structural-steel sub-bases. Other equipment includes Winslow lube-oil filters, Peerless centrifugal water-circulation pumps, Alnor pyrometer systems, Fulton-Sylphon safety devices and Young radiators. The small amount of wear evidenced by figures shown in the inspection record indicates that the crude-oil fuel is satisfactory from an abrasive standpoint. The crude is centrifuged, but not heated. Lubricating oil is heavy-duty SAE 30. Regular spot testing of equipment includes checking the condition of lube oil and specifying when it is to be changed. Oil changes depend upon its condition and vary from 335 to 1329 hours of operation.

Dynamometer Installed

Now in daily operation at the factory of Kenworth Motor Truck Corporation in Seattle is a new chassis dynamometer—one of the largest on the coast—recently installed to increase the efficiency and speed of testing procedures. Thorough testing of trucks before delivery has in the past meant as much as 70 miles of driving in the area near Seattle to find the right combination of traffic conditions and terrain to develop the necessary road speeds and horsepower output. Now, a Kenworth truck "gets the works" even more thoroughly and efficiently than before without going out of its own backyard. The chassis dynamometer consists essentially of a set of rollers connected to a water brake for measuring and absorbing horsepower. The rollers are located in the floor of the dynamometer house at the Kenworth factory in such a manner that the truck can be driven onto them and operated in any combination of gear ratios and at any throttle setting or speed desired. A complete set of instrumentation is provided so that the horsepower output of the truck engine can be measured under any set of conditions.

In addition to checking the performance of the engine and cooling system, temperature readings are taken of the main and auxiliary transmissions, front and rear differentials. A total of 38 items are checked during this inspection. An unusual feature of the dynamometer is an arrangement whereby the truck wheels may be turned, through the use of a 36 horsepower electric motor, by the dynamometer rollers. This means that the truck engine can be shut down and the truck's wheels, drive lines, transmisisons and axles "motored," thus determining the amount of torque required to drive them. Readings taken assist the mechanic in tracking down misalignment or maladjustment. In addition to the items checked on the dynamometer, a test lane has been provided in the dynamometer house at Kenworth to perform 10 additional items of inspection, including the adjustment of the headlights, front wheel alignment, wheel balance, and other checks. Adjacent to the dynamometer house, Kenworth has installed a recently completed 40,000-pound capacity, 30-foot truck scale. After completion of tests in the dynamometer house, each Kenworth truck is given a shakedown trip on the highway to determine ease of steering and general roadability.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Smoother Power

starts here

...in the LANOVA combustion system

Low peak cylinder pressures and low rates of pressure rise are characteristics of Diesels using the Lanova Combustion System. What this means in layman's language is simply this – when your Diesel uses the Lanova design you'll have smoother, quieter operation at all loads and speeds.

The key to this smooth combustion process is the Lanova energy cell. Its unique design cushions the rapid build up in combustion pressures and transforms them into a powerful working thrust which drives the piston down over a full degree of the power stroke. There are no pounding, noisy hammer blows of combustion pressures in a Lanova-type Diesel – just plenty of smooth, flowing power.

MOST LEADING MAKES of Diesels use the Lanova Combustion chamber principle. But be sure of getting what you want – always look for the distinctive Lanova energy cell design.

Lanova

LANOVA CORPORATION
38-17 30th Street
Long Island City 1, N. Y.

ONE OF AMERICA'S FOREMOST NAMES IN DIESEL RESEARCH AND DEVELOPMENT

Florida Diesel News

By ED DENNIS

POP EYE TWO, a Norseman designed 60x16 party fishing boat being built at Chris Boat Yard; 2 G.M. 6-71 diesels, Twin Disc 2:1 clutch and reduction gears, 26x26 Columban propellers, George Hamway of Bakers Haulover is the owner.

CHOHOLOSHEE, Lake Okeechobee; a new 30 ft. school boat with a 6-298 Kermath 84 hp. diesel, 1:5 Greyhound reduction gears and Snow Nabstedt clutch; also 2 G.M. 6-71 diesels for the 57 ft. *Judith R* of Rye, New York; from Miami Marine Engineers.

PALM BEACH, the 48 ft. off shore cruiser *Edorea* had a pair of G.M. 6-71 diesels installed by Frank Knorr Inc., Snow Nabstedt hydraulic gears operating through a Huckins "V" drive turning a 23x23 propeller.

GOLD ROCK CREEK, Grand Bahama Island; 4 model D 364 Caterpillars with 150 kw. Allis Chalmers generators; as power for the guided missile base, engineered by Shelley Tractor of Miami.

M.V. *KAY JEAN*, The Bahama Lumber Co., 3 225 hp. Gray marine diesels and 2—85 hp. Hercules diesel engines with General Electric generators, used for hauling lumber from Andros Island to Nassau, Bahama Islands.

MARATHON, KEY VACAS: 2 model V.A. 120 hp. Fairbanks-Morse 2 cylinder diesel sets with Fairbanks Morse 72 kw. generators and 9½x9½ Vilter refrigerator compressors, delivers 50 tons of ice daily for the Palm Ice Co., Manzel force feed lubricators.

LINDA JEAN of Key West, a new 50 ft. shrimp trawler for Warren Lowe; the D 318 Caterpillar 70 hp. diesel and Snow Nabstedt 3:1 reduction gears came from Shelley Tractor at Key West.

AT CRAWL KEY—R. H. Wright Construction Co., a Euclid dump trailer with a model NHRS Cummins 300 hp. diesel, Bendix Westinghouse air compressor, 1 International Harvester TD 14 dozer, 2 Mack Lanova 10 wheel trucks model END 519, 131 hp. and a Caterpillar #12 100 hp. road scraper.

RICAN STAR of Puerto Lemon, Costa Rica; 185 ft. ex-banana boat being outfitted as a freeze ship for shrimp trawlers. 2 15-ton and 1 5-ton York refrigeration compressors with Louis Allis 20 hp. motors at Miami Shipbuilding Corp.; the 2 model DFXE Hercules diesels with Imperial 50 kw. generators came from Auto Marine Engineers. The vessel is owned by the Costa Rican Trading Co. of Dallas, Texas.

J. M. CRAIG of the Jacksonville Yacht Storage Co., reports that they are going into the "package unit" plan of shrimp trawlers using the Murphy 190 hp. diesel engine which has proven so successful in long range shrimping.

M. V. *SOLARIND*, a Dutch West Indies 125x25 ft. freighter at Jones Shipyard, has a model LP 5 cylinder Superior diesel and a 10 kw. Witte generating set.

GENERAL MOTORS, Diesel Engine Sales Division of Miami will open a branch for service and parts in Key West after the hurricane season is over in November.

DJAKARTA, Indonesia is the port of entry for the 63 ft. *Chaser* repowered with 2 165 hp. G.M. 6-71 diesels, Borg-Warner clutch 1.5:1 reduction gears. The *Kim* and the *Carol-Flo*, sister ships except for Twin Disc clutches, will follow shortly; to be used by the Indonesian government against smugglers. Converted and repowered by Charles Mills on the Miami River.

NARANJA ROCK CO., Naranja; received another TD 24 International Harvester tractor from the Florida Georgia Tractor Co., making a total of 5.

GENERAL MOTORS Mobile Diesel Service School announces its schedule for Florida: Sept. 2 through Sept. 5th at Tallahassee. Sept. 15th through Sept. 19th at King Motor Co., 700 East Sunrise Blvd., Fort Lauderdale. This mobile unit deals mainly with the truck application of the 4-71 G.M. diesel.

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Fairbanks, Morse Promotions

Orren S. Leslie

R. H. Morse III

Fairbanks, Morse & Co., Chicago manufacturers, have recently announced that R. H. Morse III has been appointed general manager of the company's Beloit, Wisconsin Works. This marks the fourth generation of the Morse family to come to the management staff of the company. R. H. Morse III succeeds Orren S. Leslie as general manager of the company's largest manufacturing plant. Mr. Leslie has been named manager of manufacturing and has been transferred to the company's headquarters in Chicago. Mr. Morse, who will now direct all phases of operation at Beloit, was graduated from Princeton University with a degree in Mechanical Engineering. During Warld War II he served in the Navy for three and one-half years as a naval officer. He is the fourth generation in the Morse family to carry on the tradition of a life career in the organization, and to spend the first years in learning the company's operations at first hand.

Mr. Orren Leslie came to the company as Beloit Works general manager in February of 1951 after twenty-two years of experience with another large manufacturer of heavy equipment. His new position carries the responsibility for all manufacturing operations in all of the company's various factories, including foreign affiliates. He has shown great ability in leadership and has been responsible to a very large extent in making progressive strides in the company's manufacturing processes.

District Service Manager

The appointment of G. J. Van Dyke as district service manager at Pharr, Texas, for Cummins Sales & Service, Inc., was announced recently from the Fort Worth general offices of the company by Ken W. Davis, President. Mr. Van Dyke began his career with Cummins Sales & Service, Inc. in 1945 as shop mechanic. He was subsequently promoted to field serviceman at Odessa, Texas, then to shop foreman at the same location. He is a native of Tahoka, Texas, and attended school there. He was employed by a construction company and worked on the building of the Naval Air Station at Corpus Christi, Texas, before coming to work for Cummins Sales & Service, Inc. Mr. Van Dyke was also employed by an equipment company at Lubbock, Texas.

Industrial Nozzle Bulletin

Anyone interested in spray nozzles for cooling ponds, cooling towers and similar heat transfer applications in power plants or industrial processes will find a wealth of information in a new 40-page Industrial Nozzle Bulletin just published by the Binks Manufacturing Company of Chicago.

This bulletin is one of the most comprehensive and best organized books ever prepared on the subject. It fully describes industrial spray nozzles for a broad range of commercial and industrial processes. Data given include nozzles dimensions, capacities and spray angles. All nozzles are illustrated and in many cases cut-away drawings showing the construction and operation of the nozzle are included. "Blue print" drawings show proper installation details where this information is required. In short, this bulletin includes everything a buyer or designer needs to select the correct nozzle for a specific application or process.

Bulletin 5200 has a unique and very handy index that lists 29 different applications for industrial spray nozzles with page references for each. By using this index full information on nozzles for any specific process can be quickly and easily found. Copies of Binks Industrial Nozzle Bulletin No. 5200 will be mailed free to all readers of this magazine who request it on their company letterheads. Address your request to: Binks Manufacturing Company, 3122 Carroll Avenue, Chicago 12, Illinois.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

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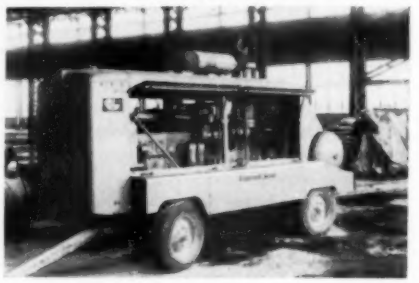
Engineering and Service Manager Of Worthington Corporation

F. E. Peltier has been appointed Manager of central regional engineering and service, with offices in Cleveland, according to W. D. Sizer, headquarters manager of the regional engineering and service department. Peltier will supervise the engineering and service in the company's district office territories of Detroit, Cleveland, Cincinnati, Buffalo and Pittsburgh. Following his graduation from Case Institute of Technology in 1940, with a B.S. degree in civil engineering, he took Worthington's student engineering course. For the next seven years he served as a project engineer in the company's Research and Development Department. Since 1949 he has been an appilcation engineer on high pressure hydraulic systems in the centrifugal and reciprocating pump divisions. Peltier is a licensed professional engineer and has made his home at 7 Mount Vernon Avenue, Summit, N. J. His new home will be at 2204 Demigton Drive, Cleveland Heights, Ohio.

General Office Representative

Appointment of Roger W. Clements as general office representative of stationary and marine renewal parts sales for the American Locomotive Company was announced by G. P. Link, manager of the renewal parts division. He will be located at Schenectady, N. Y. Mr. Clements worked from 1946 to 1948 as stationary and marine diesel engine sales representative at Alco's St. Paul office. He then went to the Service Pipe Line Company of Tulsa, Oklahoma as a mechanical engineer. In 1950 he was recalled to active duty with U. S. Navy Bureau of Ships and rejoined Alco in early 1952 as a member of the renewal parts division. Mr. Clements will be in full charge of all matters pertaining to stationary and marine diesel engine renewal parts.

Speeds "Gunite" Application

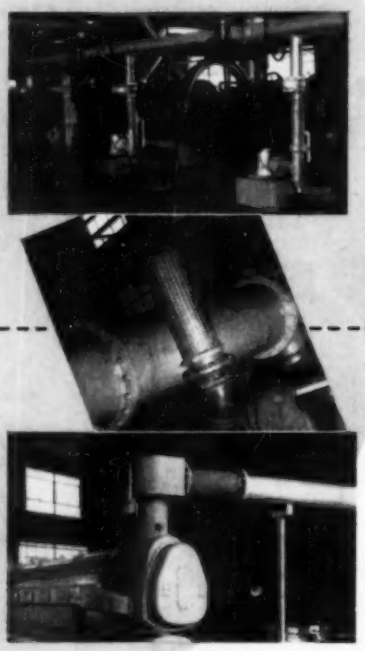


The speed with which "Gunite" walls and other "Gunite" work can be constructed has been increased approximately 25% through the use of a newly developed 600 cfm. rotary type air compressor in place of a 500 cfm. conventional type air compressor formerly used when two "Cement Guns" were required on a project. One of these units was installed by Hanna, Zabriskie & Daron, Detroit "Gunite" contractors, in August, 1951, and since that time company records have consistently reflected this substantial production increase. These compressors, although smaller than other big capacity portables, deliver an adequate air supply for keeping two "Cement Guns" used in the "Gunite" process operating at top efficiency.

Harvey Hanna, president of the company, explained the compressed air motor which drives the mechanism of each "Cement Gun" requires approximately 60 cubic feet of air per minute. The capacity of the rotary type compressor is 600 cfm, so after the demand for two "Cement Gun" air motors is met there remains 240 cfm. for conveying the dry cement-sand mixture from each of two "Cement Guns" through the material hose to the point of application. Progress on a recent job which involved over 67,000 square feet of 2 in. wall on a high industrial building was consistently maintained at the rate of 100 square feet per gun per hour.

The rotary compressor used is the "Gyro-Flow 600" developed and manufactured by Ingersoll-Rand. It is powered by a six-cylinder GM diesel engine. The engine is direct connected to the compressor mechanism and turns at 1800 rpm. The availability of smaller high-speed two-cycle diesels was an important factor in the development of this new compressor. Its use helped the designers produce a compressor of higher capacity and also reduce its size and weight in comparison to portable units of equal output. Hanna, Zabriskie & Daron since 1922 have specialized in pneumatically applied concrete, which is, of course, commonly known as "Gunite." The company owns and operates 15 "Cement Guns."

Large Diameter CMH REX-WELD CORRUGATED FLEXIBLE METAL HOSE



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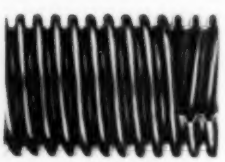
Wherever large diameter connections must have the flexibility to absorb vibration or expansion and contraction, correct for misalignment or allow movement, and yet provide the rugged durability of metal, CMH REX-WELD Type RW-75 is the answer. REX-WELD Type RW-75 is the flexible connection that requires no packing, no periodical maintenance. All metal construction is completely gas and liquid tight.

For full information and data sheets see your local CMH distributor—look for his name in your classified telephone directory—or write direct.



CMH REX-WELD Type RW-75 is helically corrugated flexible steel hose and is made in sizes from 5" to 24" I.D., inclusive. Furnished with standard pipe nipples, couplings, fixed or floating flanges. Flanges to customers design can also be attached. Where required RW-75 can be supplied with metal braid covering.

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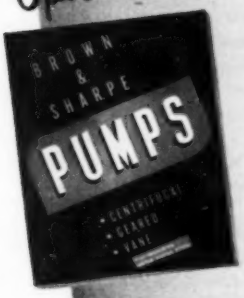

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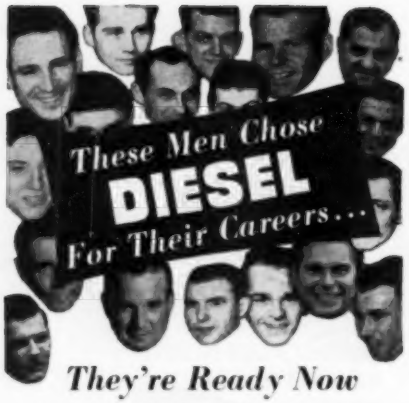

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Inland River Reports

By DAVID I. DAY

UNDER CONSTRUCTION for fall completion is the *Stanton Smith* of the Missouri Valley Barge Line at Cape Girardeau, Mo., under supervision of the owners. The boat will be 145 x 34 x 11 and will have twin General Motors (Cleveland) diesels totaling 1800 hp. She is named for the president of the Smith Oil & Refining Company at Rockford, Ill.

MUCH ADO was made recently around Beaumont and Port Arthur, Tex., when the motor vessel *Robin* hove into view there for the first time. She left at once with three barges of fuel oil for Fulton, Ill. Like the new *Stanton Smith*, she is an MVBL pusher, built at Cape Girardeau and powered with General Motors diesels.

WE NOTICED THE *Lulubelle II* on our Mississippi River trip in July. She was pushing gravel at Memphis for her owners, the Mid-South Equipment Company of that city. She is certainly a nice little towboat, apparently around 50 feet long. She has twin Cummins diesels totaling around 400 hp. She is a recent product of St. Louis Shipbuilding & Steel.

WE HEAR BY MAIL that Capt. Gordon C. Brumley is doing a nice job towing oil in the Arkansas City, Ark., to Cape Girardeau trade. This boat belongs to the J. D. Streett fleet of St. Louis, called the *Shawnee*, and has been on the various rivers for the last 14 years. She has Cooper-Bessemer engines.

ONE OF OUR HOUSTON READERS sent us a snapshot of the fine old veteran, the *St. Paul Socony* of the Socony-Vacuum Oil fleet of St. Louis. The picture was evidently taken in the Intracoastal Canal somewhere east of the big town. We saw this vessel when under construction at the Ingalls Shipyard at Decatur, Ala., on the Tennessee River. She is powered with twin Superiors, about 1500 hp.

THE *GEO. T. PRICE* of the O. F. Shearer fleet, once a steamboat, advertised well her 1600 hp. Superior twins recently by pushing 34 coal barges up the Kanawha. The tow covered more acres than any that ever passed up that river, it is believed by old-timers along that stream.

THE NOTED COAL PUSHER of the Ohio River Company, the *Robert W. Lea* (formerly the *Onward*) has been towing coal on the Monongahela in recent weeks and has had many admirers as she was built by the Hillman shipyards at Brownsville. She has twin General Motors engines, 1600 hp.

DURING RECENT WEEKS also we have noted the *Chilli Simpson* of the Simpson Towing Co., Charleston, Mo., far up the reaches of the Ohio. No one recalls having seen this boat in those waters previously. She is now under charter to the C. J. Dick Towing Co., Houston, Tex. When seen she was towing chemicals. She is a Cooper-Bessemer pusher, twins, 2200 hp.

MISSOURI RIVER BOATING has been resumed Omaha to St. Louis. The *Franklin D. Roosevelt* of the Federal Barge Lines is in this trade, commanded by Capt. Leonard W. Thompson. The *Roosevelt* is one of the few powered by McIntosh & Seymour diesel engines. Some five years ago she made newspaper headlines by pushing up to Sioux City, Iowa.

THE *CHARLES R. STEVENSON* (once the *Sohioan*) is affectionately referred to as "The Champ" in coal transportation circles. She is moving the biggest tows of the black diamond currently observed above Cincinnati on the Ohio. She is owned by the Ohio River Company, Cincinnati, and is powered by Fairbanks-Morse twins, 2415 hp.

THE *JOSEPH SMITH* and the *L. M. Smith* of the Edward Smith, Inc., fleet, Pittsburgh, are at work but hardly recognizable. Both are newly painted white with green trimmings, and with red hulls. Both are Fairbanks-Morse powered and under various names have operated on the upper Ohio for 25 years. (Both are sternwheelers.)

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Crawlers in Strip Mining

The Sloss-Sheffield Steel & Iron Company of Birmingham is able to keep four churn drills busy on exploration work by using this International TD-14A and bulldozer to run interference for drilling crews by cutting new roads through heavily wooded sections.

Diesel crawler tractors are figuring prominently in iron ore strip mining activities around Russellville, Ala., a section that produces 2,500 tons of high-grade iron ore daily for the blast furnaces at Birmingham. Big producers in the northwest part of Alabama are speeding exploration, stripping, stockpiling, and the movement of ore from the pits to rail heads by increased use of diesel crawlers for clearing trails through the timber for churn drills, working with draglines in removing overburden, and building haul roads for trucks that move the rich brown ore from pits to railroad sidings.

Expansion Joint Bulletin

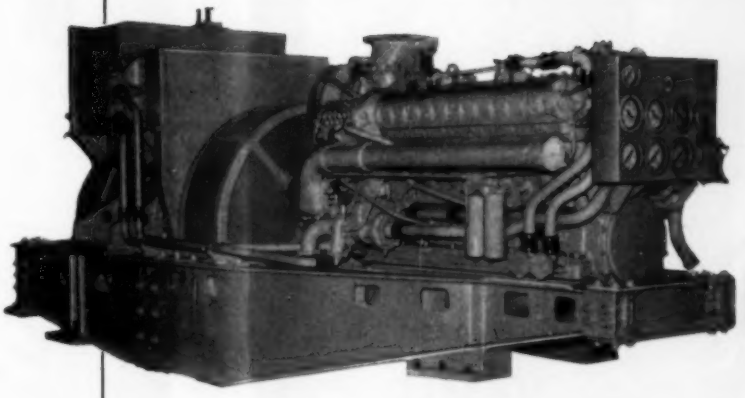
An illustrated bulletin describing the new Flexon line of expansion joints has just been released by Flexonics Corporation, formerly Chicago Metal Hose Corporation, Maywood, Illinois. Recent design changes have produced improved Flexon expansion joints capable of accommodating increased expansion with fewer corrugations. The new bulletin gives complete specification and installation data for Flexon-type Free-Flexing joints for low pressure applications, Controlled-Flexing joints for high pressure installations, and Flexoniflex joints for the handling of extremely high pressures. For a copy write Flexonics Corporation, 1325 South Third Ave., Maywood, Illinois, requesting catalog CMH-119R.

Inaugurates Placement Program

A new placement program for recruiting and training college-graduated engineers has been christened by Worthington Corporation with the signing of 52 engineers. This announcement was made by E. J. Schwanhausser, executive vice president, who said the program is a part of a newly-created personnel and training department, organized under the direction of J. J. Thompson, manager. The new department, he said, absorbs the functions of the company's former sales personnel division and embraces recruitment, training, education, and development of new technical personnel for all branches of the company, including sales, manufacturing, accounting, purchasing and engineering. The department also will be responsible for the administration of employment and personnel matters in connection with nontechnical personnal in the district offices and headquarters departments. Mr. Schwanhausser stated that the new department does not displace any functions of the manufacturing plant's personnel offices.

In his new capacity, Mr. Thompson will work directly under and be responsible to a nine-man personnel advisory committee. In addition to Mr. Schwanhausser, who will serve as chairman, committee members include H. A. Feldbush, vice president in charge of engineering; L. C. Ricketts, vice president in charge of manufacturing; T. J. Kehane, assistant vice president and general sales manager; R. M. Watson, assistant vice president in charge of engineering; E. Barwell, industrial relations coordinator; D. S. Gibson, assistant to vice president in charge of purchases and traffic; H. C. Cobb, assistant comptroller; and Mr. Thompson. Under the program these 52 new trainees receive an intensive 12 month period of orientation and practical experience in all aspects of the company's activities. The first six months will be devoted to giving the new men a diversified background in the company's activities and departments, including sales, manufacturing, accounting, purchasing and engineering. During this period trainees will be rotated on a planned schedule among the company's plants at Harrison, N.J., Buffalo, N.Y., Holyoke, Mass., and Wellsville, N.Y. At each spot they will receive instructions and training in the products made by that particular plant. During the second six months the men will be assigned to specific jobs at one of the company's plants, at a district office, or in a headquarters department. Assignments will be made according to company requirements, but insofar as possible, close attention will be given to individual preferences. At the end of the 12 month period permanent assignments will be made.

Alnor Pyrometers for *New* Packard Marine Diesel Engine



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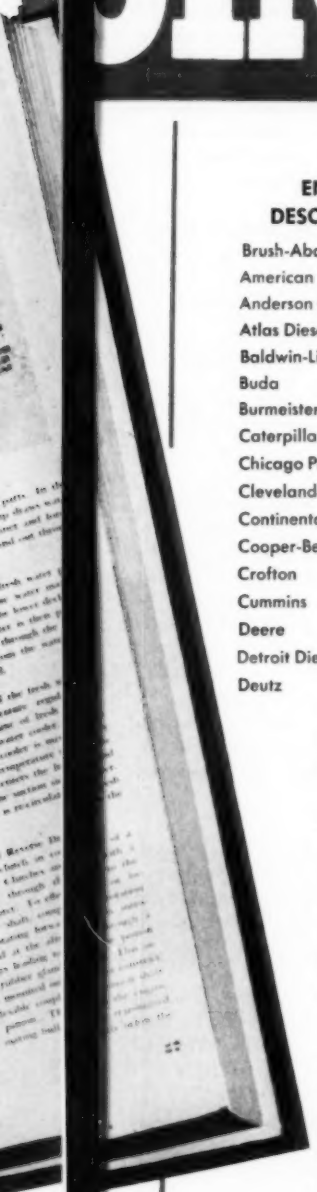

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West Coast Diesel News

By FRED M. BURT

THE 77th TUNA clipper built by the Campbell Machine Co., San Diego, since 1924, is the 150 ft. *Constitution;* managing owner, Capt. Joe S. Rogers; propulsion power, Union 1,000-hp. (@ 300 rpm.) 6-cylinder supercharged diesel; auxiliaries two 125-kw. diesel-generating sets with 250 hp. (@800 rpm.) Union diesels and a Buda 50-kw. standby set, two air compressors by Worthington, oil purifier, De Laval puri-filter.

SUPPLIED THROUGH Northern Commercial Co., Seattle, for Buffalo Lodge, Fairbanks, Alaska "Caterpillar" 50-kw. diesel generating set (80-hp. engine) for power and light, also with Vapor Phase, using jacket water and exhaust heat for water and space heating; similar set-up with 20-kw. set, 35-hp. "Cat" diesel, and Vapor Phase, at Rainbow Trucking Center, Valdez, Alaska.

VERY WELL KNOWN in diesel engine circles in the West for many years, J. H. "Jake" Czock, special representative of diesel engine div., National Supply Co., died recently in Salt Lake City. He worked previously for Worthington, Fairbanks-Morse, and Atlas Imperial Engine Co.

BUILT IN A Nova Scotia shipyard, six 58 ft. shrimp draggers, powered with Atlas 4-cylinder 85-100 hp. marine diesel engines, and one-cylinder, 6-hp. Lister-Blackstone diesels for auxiliaries, were delivered by Canadian crews after a 5500 mile trip, to Congeladora de Mazatlan S.A. Mazatlan, Mex.

INSTALLED TO supply power at the Topeka, Kan. Sewage Disposal Plant, two 180-hp. and one 560-hp. Worthington natural gas engines operating on sewage gas; Vapor Phase installation supplies steam heat to digester tanks through production of low pressure steam from jacket water and exhaust waste heat.

FOR USE AT the Shell Oil Co. gasoline plant at Ventura, Calif., a natural gas driven 6-cylinder 660-hp. Cooper-Bessemer compressor.

RECENT SALES of natural gas engines by Bethlehem Supply Co., Los Angeles, to major oil companies includes six 125-hp. 6-cylinder Waukesha's for pumping and compressors; four 85-hp. Waukesha engines to power centrifugal pumps and generators.

SUPPLIED BY Buda Engine & Equip. Co., Los Angeles, seven 180-hp. Buda natural gas engines for custom-built 100-kw. diesel-generating sets (Delco generators) by Anderson-O'Brien Co., (L.A.) for use by Norris-Thermador Co., Riverbank, Calif. as standby for heat-treating furnaces; equipped with automatic starting units, the engines are also converted for propane gas, using Ensign carburetors and vaporizers.

FOR HATHAWAY OIL CO., Santa Fe Springs, Calif., to power a portable drilling rig a 170-hp. "Caterpillar" diesel engine with Twin Disc torque converter from Shepherd Tractor & Equip. Co.

ADDITIONAL Cooper-Bessemer gas engine driven compressors for Pacific Gas & Electric Co., five 10-cylinder, 2500-hp. units; three for Hinkley (Calif.) station on natural gas line to Texas; two at Barstow.

TWO CONTRACTS for shipbuilders Fellows & Stewart, Terminal Island—35—45-ft. long U. S. Navy picket boats to be finished by March 1953—each powered with a 165-hp., Graymarine diesel engine; also 29—65-ft. steel harbor tugs for the Air Force, powered with 600-hp. Atlas diesels, completion date July 31, 1953.

FOR CONTRACTORS Merritt, Chapman & Scott and The Savin Corp., at Folsom Dam, two 170-hp. Caterpillar diesels direct-connected to centrifugal pumps; also two 20-kw. diesel-generating sets (35-hp. "Cat" diesels).

SUPPLIED BY Marine Equipment Co., Seattle, 8-hp. Lister diesel engine auxiliaries for halibut schooner *Kodiak*, owners Lee Campbell and Haakon Bjerknes; for halibutter *Seattle*, Tony Eliason and son Eilert.

FOR POWERING a Vickers long stroke pumping unit, purchased by a major oil company for their field near Fillmore, Calif., a 200-hp. Waukesha natural gas engine.

RE-POWERING the fourth of their fishboats with a 53-hp. "Caterpillar" marine diesel, also with 2:1 Twin Disc reverse gear, makes the Castagnola Bros. (Santa Barbara) fleet, 100% "Caterpillar" powered.

FOR RE-PRESSURING, new Clark natural gas driven compressors at Union Oil Company fields—two 8-cyl. 300-hp. units at West Hole Lease, Brea, Calif.; one 330-hp. 8-cylinder; one 225-hp. 6-cylinder at San Sinema, near Whittier, Calif.

FOR Eureka Corp. Ltd., Eureka, Nev. to operate pumps and mining machinery at 7,000 ft. elevation mine, two Worthington 1200-kw. diesel generating sets (with turbo-chargers); Engineering Controls' Vapor Phase system, using jacket water and exhaust heat, supplies steam heat for office and other buildings.

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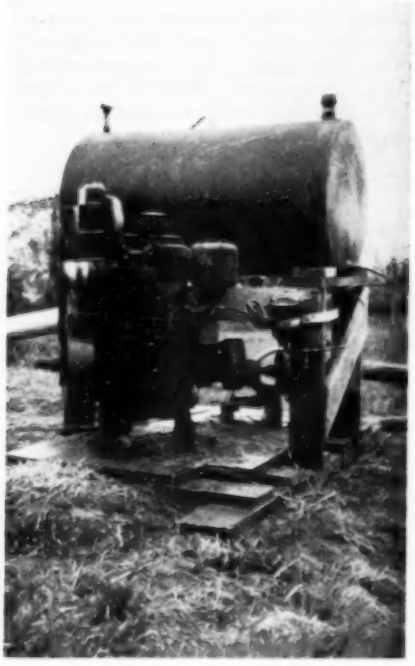
Economies in Irrigation

Washington farmers are now diesel minded when it comes to powering their sprinkler irrigation systems. During the past two years, a large number of electric pumping units have been replaced by diesel and when one examines the economics of this change over, the reasons for this trend are only too obvious. Careful logging of operating costs of a dieselized sprinkler system and a motor driven set working in adjacent fields of pasture land has enabled a very interesting comparison to be made. Reduced to a cost per acre basis over a five months season, the electric driven pump worked out at $7.90 per acre on a 20 acre plot. The diesel set, providing water for a 38 acre field, cost $2.51 per acre, over two-thirds saving.



Some may argue that the initial investment and installation costs of a diesel are higher than a motor, but when one takes into consideration the cost of running a power line to the electric pump, there is no appreciable difference between the two systems. Not to be overlooked is the fact that a portable diesel pumping unit requires considerably less aluminum irrigation piping than a centrally located permanent electric pump. Another saving with the diesel is that no transformer rent has to be paid during the idle seven months of the year. The average type of sprinkler irrigation system being used in Washington requires some 250 gallons per minute at a head of 120 feet water. The water is generally lifted from a slough at the end of the field or in some cases the water is pumped from a well.

The diesel engine being used for this operation is a Petter two cylinder model AV2, which develops 10 hp. at 1500 rpm. Both air and water cooled Petter diesels are in use. The pump unit is a Myers centrifugal type driven by "V" belting and the whole set, including the fuel tank, is mounted on a common skid which is easily transportable by tractor. The Petter engine is of simple rugged design, easily started by hand and has a very low fuel consumption. When operating at full load, only 0.4 gallons of fuel are consumed an hour. Motor Parts Machine Company, Seattle, the Petter distributors, are primarily responsible for introducing this small dieselized irrigation sprinkler system. In conclusion, it should be said that this is yet another example where the farmer today is becoming more and more conscious of the huge saving and other advantages afforded by dieselization.

Manager

Brooks Herrings has been appointed manager of the Lubbock branch of Stewart & Stevenson Services, Joe Manning, general manager, has announced. The Lubbock branch of Stewart & Stevenson is located at 1614 Fourth St. Stewart & Stevenson was recently given an extension of their General Motors distributor franchise in the Lubbock area so that new engines as well as parts and service are now available through the Lubbock branch. Stewart & Stevenson is one of the nation's largest distributors of GM diesel engines. The company is also distributor for Chrysler, Continental Red Seal, Petter diesel, Chicago Pneumatic engines, and Gardner-Denver pumps.

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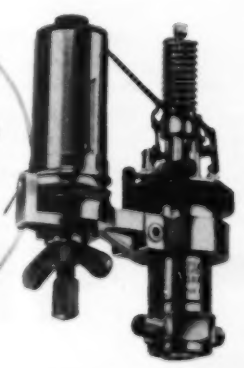

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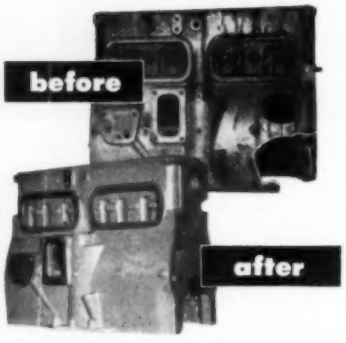

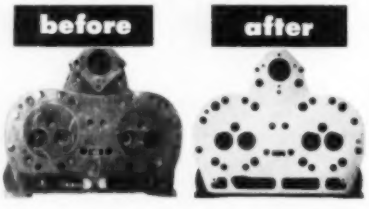

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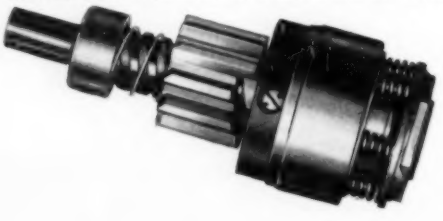

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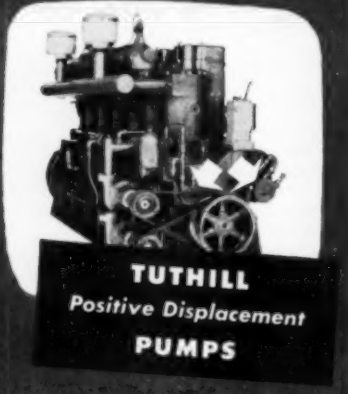

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2 ***Power Factor*** . . . in-plant power generator can eliminate power factor penalties.

3 ***Emergency Power*** . . . insurance against lost production and damage resulting from line failures.

4 ***Handle Surge Loads*** . . . that may now be affecting current characteristics of entire plant.

5 ***Plant Expansion***...need not be restricted due to lack—or expense—of ample power.

6 ***Useful Heat*** . . . lube oil, water and exhaust heat can be turned from waste to profit.

7 ***Chemical Value*** . . . exhaust gases are high in free nitrogen—available for economical fixation of nitrates, ammonia, etc.

8 ***Insurance Advantage*** . . . of diesel over gasoline engine, for example, will soon pay for installation.

9 ***No Weather Worries***...ice, snow, sleet, wind storms can't stop plant operations.

10 ***Handle Increasing Load*** . . . in-plant power economically adds to current capacity as loads increase.

11 ***Fuel Economy*** . . . use diesel oil, natural gas or sewage gas for added economy.

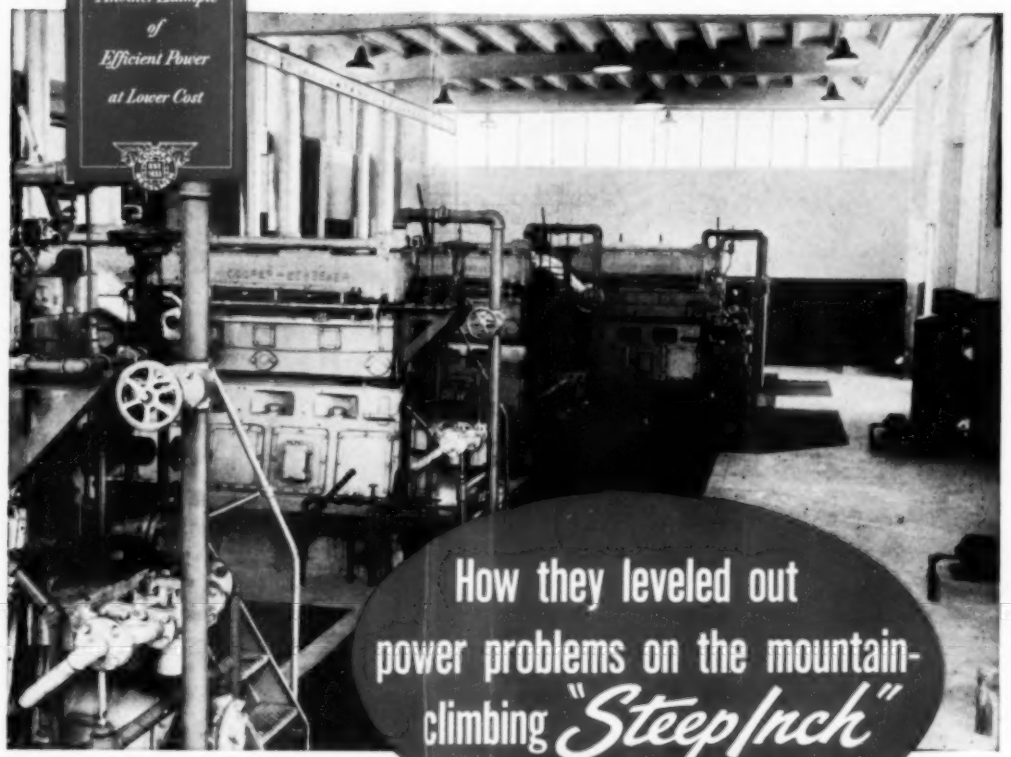
12 ***Remote Locations*** . . . distance from transmission lines needn't curtail plant expansion.

13 ***More Compact Power*** . . . Fairbanks-Morse engines give you more power per foot of floor space, more power on present foundation.

14 ***Minimum Attendance*** . . . Fairbanks-Morse in-plant generating sets require far less supervision or maintenance.

15 ***Save Cost*** . . . of running in new line where present transformers and power lines are already loaded.

Another Example of Efficient Power at Lower Cost



How they leveled out power problems on the mountain-climbing "Steep Inch"

WHAT with grades up to 45 per cent, it's no wonder the Tacagua products line is nicknamed the "Steep Inch." This new line, joint project of Creole Petroleum Corporation and Shell Caribbean Petroleum Company, rises sharply from sea level at Catia de la Mar, reaches a crest of 3,200 feet over mountainous terrain, and terminates at Caracas.

In a project like this, reliable, trouble-free power is more than ever a matter of prime importance. They played safe on this problem — picked Cooper-Bessemer diesels to do the job. The three 580 hp Cooper-Bessemer JS-8's shown above are driving pumps. Two more JS-8's drive generators for electric power requirements. They are the kind of engines you can count on for diesel performance at its best . . . any time, any place, in any service.

The **Cooper-Bessemer** *Corporation*

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